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INTELLIGENCE TEST SCORES AND BUSINESS SUCCESS[1]

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SUMMARY

One hundred and two business men attending the Babson Statistical Conference at Wellesley Hills took the Bureau of Personnel Research Test VI, a spiral-omnibus form of the Army Alpha intelligence examination. The group was a representative sampling of successful business men: salesmen, sales managers and executives.

The scores ranged from 27 to 174; median, 106; interquartile range, 88 to 128. (The maximum possible score on Test VI is 184.) In terms of the army intelligence scale, 54 per cent of these men would be rated A; 29 per cent, B; and 17 per cent, C+ or C.

Two of the three lowest scores were made by presidents of their concerns. But it is to be noted that even these are fully equal to the average American in intelligence. Every individual in the entire group is in the upper half of the population; which suggests that at least this *minimum* of mental alertness as measured by an intelligence test, is important for business success.

To discover possible differences of vocational profile, an analysis was made of the relative proficiency of older and younger executives, sales managers and salesmen, in each of the six types of question included in the test: disarranged sentences, arithmetic, opposites, number completion, analogies

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[1] Read in part at the meeting of the American Psychological Association, Madison, December 28, 1923.

and information. The most significant differences are that the salesmen did better than the executives on disarranged sentences, and less well on arithmetic and number completion. Business men with college training did better upon disarranged sentences and opposites than men with less schooling.

Each man who took the test was notified by mail of his score and its meaning, and was asked to fill out an experience record. Of the 102 who took the test, 73 returned experience records. These had made, on the average, better scores than had those who did not respond.

Using the data contained in these experience records, ratings of the business success of these 73 men were made by five judges, independently. The extent of agreement among these judges is indicated by the intercorrelation between their ratings: an average coefficient of +0.60.

The combined success ratings, when correlated with the scores on Test VI, give a coefficient of −0.10. In other words, no significant relationship was found between intelligence as measured by this type of mental alertness examination, and relative business success—within this successful group—as estimated from data on a personal history blank.

The correlation between years spent in school and test score is +0.44. Many other correlations with test performance were computed, as well as correlations between items on the experience records; but the number of cases proved to be too small to lend significance to the relationships disclosed.

The question is brought forward as to the relative significance of intelligence and of non-intellectual traits of personality as factors in business success.

I. INTRODUCTION

Does outstanding success in business depend primarily on intelligence? To what extent may it be assumed that the brighter a man is, the farther he will go on the road toward business achievement? Do brains count for more than character and personality?

University teachers are prone to magnify the importance of intelligence. It is, indeed, likely to be the chief factor in their own success. They tend to estimate the effectiveness of their colleagues in terms of intellectual accomplishment. They rank their students in order of ability to master and manipulate ideas.

In the world of business, on the other hand, success is first of all a matter of getting things done. Ability to persuade and control people is an outstanding asset. Effectiveness within an organization demands such traits as dependability, coöperativeness, energy, promptness of decision. If traits like these are present in high degree, a man may make a notable business success even though his mental alertness test rating on the Army scale is only B or C. Intelligence there must be, above a certain minimum. But this minimum is, perhaps, not so high as is often supposed.

It is the purpose of this paper to report some intelligence-test measurements of a group of business executives; to indicate the range and distribution of test scores within this group; to compare them with other business men; and to note the relationship of certain personal history items to estimated success as well as to proficiency in different parts of the test, and to total score.

II. SUBJECTS; PERSONAL HISTORY DATA

One hundred and two business men attending the annual statistical conference held at the Babson Institute, Wellesley Hills, Massachusetts, August 4, 1922, constitute the sample selected for study. About half of these men were college graduates and a fourth of the remainder had attended high school. Nearly four-fifths were executives. One-fifth were salesmen. (Eleven sales managers are here classed with executives.) There were wide differences in age as well as in education and in type of work. The executives ranged from twenty-five to sixty-three years. For statistical purposes they were divided into two groups, younger and older, at the median age of forty-one. The ages of the salesmen ranged from twenty to fifty-nine with the median at thirty-one years.

Personal history data regarding the men examined were needed, to furnish a criterion for use in evaluating the share of intelligence in business success. We wanted, also, to see to what extent certain items such as experience, or schooling, correlate with business success or differentiate salesmen from executives. Seventy-three of the men examined were kind enough to furnish the desired personal history data, and the bulk of this report concerns itself with an analysis of these data, an attempt to extract from them a criterion of success, and a study of certain correlations between (*a*) this criterion, (*b*) test scores, and (*c*) selected items of personal history.

The form used for getting the personal history data is a typical application blank which calls for the following information: name, date, address, date and place of birth, lineage (American, English, Hebrew, etc.), height, weight, number of dependents, marital status, schooling, account of how time has been spent since leaving school, salary in last three positions and reasons for leaving, time spent in inside (retail) selling, time spent in outside selling, occupations of relatives, forms of investment now owned, amount of indebtedness, membership in clubs, in fraternities, in business organizations, in church; offices held in these organizations, participation in sports, attendance at social affairs, physical infirmities, time lost through illness and nature of illness.

Of these items, the following yield data expressible in quantitative units, and so can be used in computing correlations: age, height, weight, number of dependents, salary, years selling, number and kinds of investments, debt, number of clubs, number of times attended theater last year, number of times took part in athletics last year, number of times attended social affairs of own sex last year, number of years in school.

A few additional items permit of statistical, though less rigorous, treatment. Of these, only the data on schooling and present occupation were studied.

With reference to schooling, the men were classified as follows:

1. No schooling	1
2. Went to grammar school but did not graduate	4
3. Graduated from grammar school	2
4. Went to high school but did not graduate	7
5. Graduated from high school	11
6. Went to college but did not graduate	8
7. Graduated from college	40
Total	73

As to present occupation, we recognized three classes: executives, salesmen, and those difficult to classify. For instance, No. 69 answered that the nature of his work was "advertising." This gave little clue as to whether he was an executive, a salesman, or what not. Eleven sales managers were classed with the executives. The group of 73, on whom personal history data were secured, was made up of 42 business executives, 20 salesmen, and 11 doubtful.

In average height, the salesmen are a trifle taller. The executives, both older and younger, center about 5 feet 7½ inches; the salesmen, 5 feet 9 inches.

The fact that the answers to a question can be objectively scored or evaluated does not insure that the information is reliable—it may be only an expression of the subject's estimate, or again, an intentional over- or under-estimation. The items seem to exhibit three grades of reliability:

1. Reliable items: Age, number of dependents, number of years in school, height and weight.

2. Fairly reliable items: Salary, years spent in selling, number of kinds of investments.

3. Items of uncertain reliability:

Number of clubs: (The answers to this question were not very full. Many of the well-known clubs do not appear in any of the blanks and as it is hardly possible to believe that none of these representative men belonged to such clubs, little use has been made of this item.)

Debt: (Upon this point approximations have very evidently been made. Those who had small debts of a personal nature and who were young or relatively poor seem to have given precise answers—i.e., they were not in round numbers. Those men who were in business for themselves and had large loans outstanding gave answers in round numbers, if at all.)

Number of times took part in various forms of athletics or sports during last year.

Number of times took part in social affairs of own sex during last year.

Number of times attended theater during last year.

(Men who have taken part in any one of these but a few times could give fairly explicit answers, but many replies are obviously rough approximations. The only use finally made of the data on athletics and sports was to consider the number of different kinds of activities in which the subject engaged.)

III. THE CRITERION

The criterion of business success was a composite rating based entirely on the information contained in the personal history records. Ratings were made independently by five men on the staff of the Division of Coöperative Research, Carnegie Institute of Technology. The raters were instructed to examine these records and to classify each case—in comparison with the entire range of business men—as belonging to one of four groups: very successful (score 1), successful (score 2), below average success (score 3), business failure (score 4). They were directed to give consideration to age: an older man should have progressed farther in the business world than a younger man equally successful. These composite success ratings were then divided into quartiles. These four classes are referred to hereafter as Success Rating A, B, C and D; Rating A signifying the highly successful quartile, and D the least successful quartile of the group.

The average rating proved to be 2.19. Since the average rating for the business population is, by definition, 2.5, it is evident that either the judges tended to rate too high, or else the group as a whole is distinctly above the average in business success. The latter is undoubtedly the case.

The reliability of these ratings is not as high as we would wish. The intercorrelations between the ratings given by the five judges range from +0.53 to +0.65, the mean being +0.60, P.E. ±0.04.[2] The ratings may be considered to have only a moderate degree of reliability, but it supplies the best criterion available under the circumstances.

It may be of interest to ask which items on these experience records most influenced the raters in estimating relative success, and to note what relationship was found between their composite success ratings and various personal history items. We shall later compare the success ratings with relative proficiency in the several types of question used in the intelligence test.

The correlations found between the composite success ratings and a number of personal history items are as follows:

	r	NUMBER OF CASES
Years in school	0.00	73
Age	+0.17	73
Number of dependents	−0.43	73
Salary	+0.76	32
Years spent in selling	+0.18	43
Number of kinds of investments	+0.27	71
Weight	+0.02	72

Apparently the number of years a man has attended school does not influence the rating of success. The age factor was held fairly constant. The number of kinds of investment shows a positive relationship with the ratings. Doubtless it influenced, to some degree, the opinions of the judges. Salary, when stated, was clearly the outstanding criterion of success in the minds of the raters, as it correlates +0.76 with their ratings. The number of dependents correlated negatively with these ratings of business success (−0.43).

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[2] All correlation coefficients computed according to Pearson product moment correlation formula.

Not all of the items appearing on the Experience Records lend themselves to statistical treatment by the Pearson product moment formula. Below are a few of those that do:

	NUMBER	r	P.E.
Age and number of dependents	73	+0.58	±0.05
Age and salary	32	+0.54	±0.08
Age and number of kinds of investment	71	+0.21	±0.08
Number of dependents and salary	26	+0.33	±0.11
Number of kinds of investment and salary	31	+0.50	±0.09
Indebtedness and salary	29	−0.23	±0.12
Years spent in selling and times attended social affairs of own sex in last year	32	+0.18	±0.12

IV. THE MENTAL ALERTNESS TEST

The intelligence test known as Bureau of Personnel Research Test VI was used. This test is an adaptation of Army Alpha. It contains no questions not found in the Army test. It uses all the questions in six of the eight parts of Army Alpha, omitting only part I, the oral directions test, and part III, the test of practical judgment. The other six types of question, including arithmetic, analogies, opposites (synonym-antonym), range of information, number series completion and disarranged sentences, are used in apparently chance sequence. But actually the examination is of the spiral-omnibus form: each question of a given type is in general more difficult than the question of the same type which last preceded it. Two pages of instructions and fore-exercises serve to familiarize the person to be examined with the six varieties of tasks; then, at a given signal, he turns the page and proceeds without further instruction to answer as many of the questions as he can within a time limit of fifteen minutes.

Advantages of this form of examination, as compared with Army Alpha, are that it can be given by any one without special elocutionary training; instead of eight time limits it has only one; and it can be scored rapidly and easily by stencil. The Bureau of Personnel Research has used this test since 1919 with several thousand subjects, and finds in general that it is quite as reliable as Army Alpha, and distinctly easier to administer. But it is less convenient to score if it is desired to study the relative proficiency of the subjects in the different parts of the test.

The formula for scoring this test is

$$\text{Score} = A - (O - W - 2w')$$

in which A = number of items gone over
O = number of items omitted up to that point
W = number of items wrong with the exception of opposites and disarranged sentences
w' = number of opposites and disarranged sentences wrong

(A mere guess at the answer to an opposites question has an even chance of being correct. This holds also of the disarranged sentences where the *true-false* response is used. Consequently penalty for error on one of these questions is made two points instead of one.)

Another way of putting this same formula is

$$\text{Score} = R - w$$

where R = answers right
w = opposites and disarranged sentences wrong

To compare the mental alertness of this group with the performance of other groups of business people, we used the following norms, compiled by the Bureau of Personnel Research from 843 cases distributed as follows: 537 life insurance salesmen, 160 specialty salesmen, 131 executives, 15 secretaries.

Norms for Test VI

SCORE IN TEST VI	DECILE STANDING
130–184	10
118–129	9
109–117	8
102–108	7
95–101	6
88– 94	5
79– 87	4
67– 78	3
50– 66	2
0– 49	1

(Decile standing shows in what tenth of all persons tested this person belongs—10 indicates the highest 10 per cent and 1 the lowest 10 per cent. For example, a person making a score of 106 would have a decile stand of 7.)

The general interpretation of the deciles is as follows:

Decile 10	very high
Decile 8, 9	high
Decile 4, 5, 6, 7	average
Decile 2, 3	low
Decile 1	very low

V. TEST RESULTS

The number of men whose scores fall in each decile of the Bureau of Personnel Research norm is as follows:

NUMBER	DECILE
19	10
14	9
14	8
13	7
9	6
9	5
8	4
8	3
5	2
3	1
102	

Obviously, this group averages distinctly higher in intelligence score than did the group of 843 which furnished the Bureau of Personnel Research norms. Nineteen make scores in the "very high" decile, while only 3 are in the "very low" decile.

The wide distribution of test scores, from 27 to 174, is shown in table 1 which gives the range, the median and quartiles for the entire group and also for the following sub-groups: salesmen, sales managers, executives, and sales managers and executives combined.

TABLE 1

Distribution of test scores

	NUMBER	LOWEST	Q_1	MEDIAN	Q_3	HIGHEST
Salesmen	22	54	90	103	112	174
Salesmanagers	11	77	94	107	128	155
Executives	69	27	84	107	128	162
Executives and salesmanagers	80	27	86	107	128	162
Total	102	27	88	106	128	174
Old norm	843		74	94	112	

The median score for our entire group is twelve points higher than the median of the norm.

The executives did better, on the whole, than the salesmen, although a young salesman made the highest score, and 2 of the 3 who scored the lowest of all are presidents of their concerns![3]

How do these test performances of business men compare with those of officers and soldiers in the Army? Fifty-four per cent of our group made scores which correspond to an A intelligence grade on Army Alpha. Twenty-nine per cent made a B grade; and seventeen per cent, grade C+ or C. Yoakum and Yerkes[4] report the percentages of men of different groups making A and B grades in Army Alpha as follows: officers, 83.0 per cent; officers' training school candidates, 73.2 per cent; sergeants, 53.4 per cent; corporals, 39.7 per cent; literate privates, 18.8 per cent. *Eighty-three per cent of the group we are studying are men of this superior caliber, a fraction identical with that found among the army officers.*

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[3] One of the writers interviewed the man who made the lowest score, and found him to be a kindly old gentleman, apparently approaching senility. He would probably have made a much higher score five years ago.

[4] Army Mental Tests, New York, Henry Holt, 1920, p. 27.

Each man's score was mailed to him, together with a request to supply the data called for on the personal history blank, and 73 responded. The 29 who did not return the experience record had made a larger proportion of less-than-average scores. The higher the score, the greater was the willingness to furnish personal history data. This fact reduces the spread of our sample and diminishes the likelihood of correlation, within this sample, between test score and estimated success.

	NUMBER	MEDIAN
Supplying personal history data	73	113
Not supplying data	29	07
Total	102	100

Figure 1 shows the distribution of test scores for the entire group and also for these two sub-groups. The tendency is obvious for those making higher scores to answer the experience questionnaire and for those making lower scores to neglect to do so.

The coefficients of correlation of test scores and several of the personal history items are as follows:

	NUMBER OF CASES	r	P.E.
Number of years in school	73	+0.44	±0.06
Age	73	−0.35	±0.07
Number of dependents	73	−0.19	±0.08
Salary	32	−0.14	±0.12
Years spent in selling	43	−0.36	±0.09
Number of kinds of investments	71	−0.28	±0.07
Height	72	+0.08	±0.08
Success ratings	73	−0.10	±0.08

The success rating, when correlated with the test scores, gives −0.10, P.E. ± 0.08. As the factor of age enters into both of these, a partial correlation was computed holding that factor constant. The partial obtained is −0.04. Business success as estimated by these judges from the available data shows no relation *within this group* to mental alertness as measured by Bureau of Personnel Research Test VI.

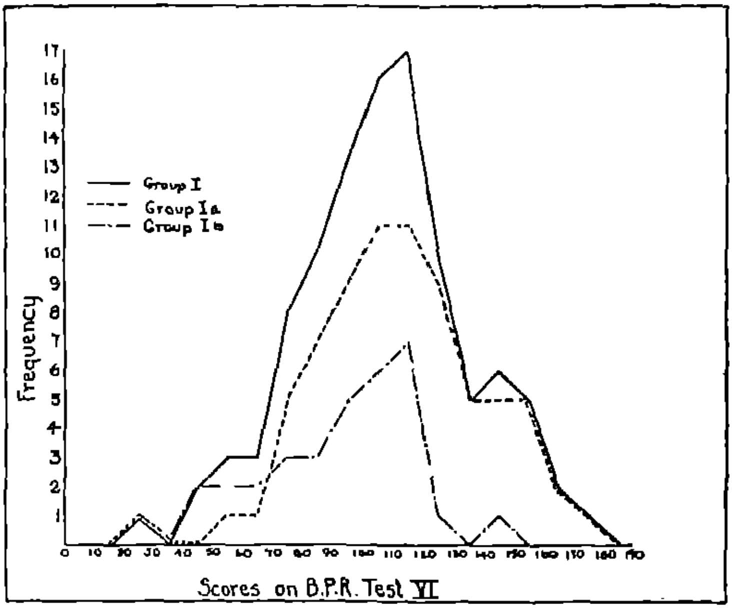

FIG. 1. FREQUENCY CURVES OF SCORES ON TEST VI

Group 1a, those supplying personal history data; group 1b, those neglecting to do so.

Cobb and Yerkes[6] have made a study of the relative ability of officers of the different arms of the Army service in the eight parts of Army Alpha. A percentile distribution of scores on each of the eight tests was prepared from the records of 15,000 officers of all arms. Then psychographs were drawn, showing for each test the median percentile score made by medical, infantry, artillery and other officers in comparison with the standard group. Striking contrasts appeared. Medical officers, for example, did relatively better in opposites and disarranged sentences than in arithmetic, number series completion and analogies. Engineers, on the other hand, excel most in the very tests in which medical officers are weakest. Chaplains show the most irregular profile, being highest of any group in the opposites test and relatively low in arithmetic and number series completion.

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[6] Cobb and Yerkes, Intellectual and educational status of the medical profession as represented in the United States army. Bulletin of the National Research Council, vol. 1, part 8, February, 1921; p. 473 ff.

TABLE 2

Proficiency table for the six types of question in Bureau of Personnel Research Test VI

		PROFICIENCY INDEX		
		1 (good)	2 (medium)	3 (poor)
		Per cent of questions wrong		
Disarranged sentences	24	0	0.01– 9.0	10.0–100
Arithmetic	20	0–2.4	2.5 –12.4	12.5–100
Opposites	40	0	0.01– 4.0	5.0–100
Number completion	20	0	0.01– 9.0	10.0–100
Analogies	40	0	0.01– 9.0	10.0–100
Information	40	0–7.4	7.5–12.4	12.5–100
	184			

To make a similar comparison of the relative proficiency of our subjects in the six types of question in the Bureau of Personnel Research test, it was necessary to devise a different method of analyzing the data. A table was prepared showing for each "total number attempted" the number of each sort of question which the person tested had had an opportunity to answer. For example, if 36 questions were attempted, the table shows that 5 of these are disarranged sentences, 4 arithmetic, 8 opposites, 4 number completion, 7 analogies, and 8 information. After computing, by aid of this table, the per cent of the problems attempted that each person had right in each of the six types of question, a proficiency table was made (table 2). This table was derived by dividing the "per cent wrong" scores of each type of question in tertiles. Thus, on the arithmetic questions, one-third of the men had less than 2.5 per cent wrong, one-third had from 2.5 up to 12.5 per cent wrong; and one-third had more than 12.5 per cent wrong. These three groups were designated "good," "medium," or "poor," in arithmetic. The "good" are referred to as having a "proficiency index of 1;" the medium, a "proficiency index of 2;" and the poor, a "proficiency index of 3."

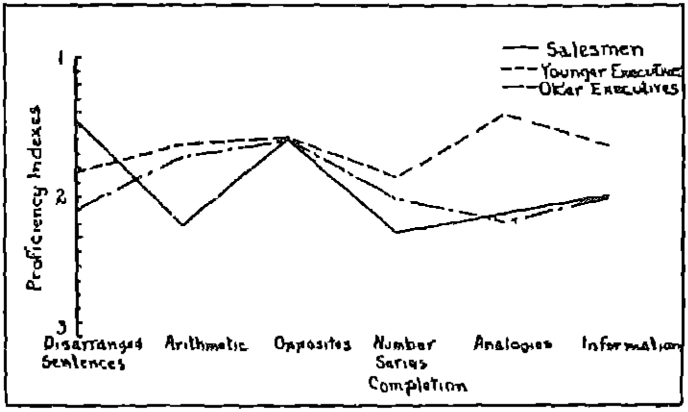

FIG. 2. PROFILES OF SALESMEN AND EXECUTIVES

The smaller the index, the higher the proficiency

By reference to this table, the proficiency of a man on any type of question can be stated in terms of his tertile position in the group. A profile can then be drawn which shows at a glance in which kinds of questions he is weak, in which strong. Then, by computing the mean proficiency of any group—salesmen, for example—on each type of question, a profile of the group can be drawn which shows graphically its characteristic excellencies or defects in the several sorts of task set by the examination. (See figure 2.) Only the tests of the 73 men who returned their experience records were analyzed in this way. Then the mean proficiency indexes were computed for different groups, so that a profile could be drawn for each group, and any outstanding group characteristic—such as facility in analogies or relative narrowness of range of information—would be instantly apparent.

Table 3 gives for each group its six proficiency indexes, one for each type of question. Table 4 shows which groups are most successful in each type of question.

TABLE 3

Proficiency of different groups on the six types of question

NUMBER	GROUP	PROFICIENCY INDEX					
		Arithmetic	Analogies	Opposites	Range of information	Number series completion	Disarranged sentences
30	College graduates	1.71	2.21	1.36	2.0	1.85	1.89
9	College, not graduates	1.55	1.66	1.44	2.33	1.68	2.11
11	High school graduates	2.09	1.81	1.83	1.54	2.09	2.18
7	High school, not graduates	2.0	1.85	2.14	2.0	2.14	1.85
5	Grammar school, not graduates	2.6	1.4	1.4	2.4	2.6	2.0
21	Older executives, 42 and above	2.07	1.71	1.37	2.0	2.18	2.0
21	Younger executives, below 42	1.81	1.61	1.57	1.85	1.42	1.61
20	Salesmen	1.45	2.2	1.60	2.25	2.1	2.0
42	All executives	1.07	1.85	1.59	1.92	2.0	1.05
10	Salesmen, college graduates	1.7	2.7	1.5	2.4	2.0	1.6
5	Salesmen, college, not graduates	1.4	1.6	1.4	2.2	1.2	1.6
20	Executives, college graduates	1.8	2.05	1.4	1.85	2.45	1.8
7	Executives, high school graduates	2.28	1.71	1.71	1.28	1.85	2.14
5	Executives, high school not graduates	2.0	1.8	1.8	2.4	2.4	1.8

The figures under each type of question in table 3 are the proficiency indexes. It is to be kept in mind that the higher the proficiency, the smaller is the index number. The possible range is only from 1 to 3, so a difference in the first decimal place may be significant. For example, salesmen who went to college but did not graduate have an average proficiency index in disarranged sentences of 1.4; while the corresponding

TABLE 4

Groups in order of proficiency

CASES	GROUP	PROFICIENCY
	Disarranged sentences	
5	Sales-college men, not graduates	1.4
20	Salesmen	1.4
9	College men, but not graduates	1.55
10	College graduates, salesmen	1.7
39	College graduates	1.71
20	Executives, college graduates	1.8
21	Younger executives	1.81
42	All executives	1.97
7	High school men, not graduates	2.00
5	Executives, high school, not graduates	2.00
21	Older executives	2.07
11	High school graduates	2.09
7	Executives, high school graduates	2.28
5	Grammar school, not graduates	2.6
	Arithmetic	
5	Grammar school, not graduates	1.38
5	Sales, not college graduates	1.60
21	Younger executives	1.61
9	College men, not graduates	1.66
21	Older executives	1.71
7	Executives, high school graduates	1.71
5	Executives, high school not graduates	1.8
11	High school graduates	1.81
42	All executives	1.85
7	High school men, not graduates	1.85
20	Executives, college graduates	2.05
20	Salesmen	2.20
39	College graduates	2.21
10	Salesmen, college graduates	2.7
	Opposites	
39	College graduates	1.30
5	Sales, not college graduates	1.40
5	Grammar school, not graduates	1.40
20	Executives, college graduates	1.40

TABLE 4—*Continued*

CASES	GROUP	PROFICIENCY
	Opposites—(Continued)	
9	College men, not graduates	1.44
10	Sales, college graduates	1.50
21	Older executives	1.57
21	Younger executives	1.57
42	All executives	1.57
20	Salesmen	1.60
7	Executives, high school graduates	1.71
5	Executives, high school, not graduates	1.80
11	High school graduates	1.83
7	High school men, not graduates	2.14
	Number completion	
7	Executives, high school graduates	1.28
11	High school graduates	1.54
21	Younger executives	1.85
20	Executives, college graduates	1.85
42	All executives	1.02
39	College graduates	2.00
21	Older executives	2.00
7	High school men, not graduates	2.00
5	Salesmen, not college graduates	2.2
20	Salesmen	2.25
9	College men, not graduates	2.33
10	Salesmen, college graduates	2.40
5	Grammar school, not graduates	2.40
5	Executives, not high school graduates	2.40
	Analogies	
5	Salesmen, not college graduates	1.20
21	Younger executives	1.43
9	College men, not graduates	1.66
39	College graduates	1.85
7	Executives, high school graduates	1.85
42	All executives	2.00
10	Salesmen, college graduates	2.00
11	High school graduates	2.09
20	Salesmen	2.10

TABLE 4—*Continued*

CASES	GROUP	PROFICIENCY
	Analogies—(Continued)	
7	High school men, not graduates........	2.14
21	Older executives..............................	2.18
5	Executives, not high school graduates.........	2.40
20	Executives, college graduates..................	2.45
5	Grammar school, not graduates................	2.60
	Information	
10	Salesmen, college graduates....................	1.60
5	Salesmen, college, not graduates..............	1.60
21	Younger executives..........................	1.61
20	Executives, college graduates..................	1.80
5	Executives, not high school graduates.........	1.80
7	High school, not graduates....................	1.85
39	College graduates............................	1.89
42	All executives..............................	1.95
21	Older executives............................	2.00
20	Salesmen....................................	2.00
5	Grammar school, not graduates................	2.00
9	College men, not graduates....................	2.11
7	Executives, high school graduates.............	2.14
11	High school graduates.........................	2.18

index for the group who did not graduate from grammar school is 2.6. The difference is 1.2, which is 60 per cent of the total possible difference.

In table 4 the reader may consider the relative performance of the different groups in each type of question separately. The groups are listed in the order of their proficiency in each kind of task. As an aid in estimating reliability, the number of cases in each group is given. The groups are, for the most part, so small that the differences in their performance are not significant.

Disarranged sentences. There is evident a definite tendency for the college men who are salesmen to do well, and for older executives and executives who are high school men to do poorly, in disarranged sentence questions. Schooling seems to affect performance, and also age.. Note that the younger executives have an index of 1.81, while the older executives have one of 2.07. The older men do somewhat less well than the younger. The salesmen do markedly better upon this type of question than do the executives.

Arithmetic. Proficiency in questions involving arithmetical reasoning is strikingly different from proficiency in disarranged sentences. The greater the amount of schooling beyond grammar school, the lower the relative proficiency. The executives do better than the salesmen here. But these trends are not so striking as in the disarranged sentence questions.

Opposites. In general, schooling seems to have some influence on performance here. The college men do best, while the poorest scores on the average are made by the high school men. No difference is seen between the average performance of groups engaged in different types of work.

Number series completion. In this type of question the executives do much better than the salesmen. The group "all executives" has an index of 1.92, while the salesmen have one of 2.25. It is curious that at either end of the list is a group of executives—one, the best, being high school graduates; the other, the poorest, being men who went to high school but did not graduate. Except for these two small groups, schooling shows no relationship with proficiency.

Analogies. Age seems to be a factor. Younger executives do well in this type of task, making an average index of 1.43; while for the older executives the index is 2.18, a difference of 0.75. Occupation and schooling are not seen to correlate with proficiency.

Information. No groups exhibit outstanding differences of proficiency upon questions involving general information. Both age and schooling might be expected to affect performance, but there is only a slight positive relationship.

Such of these findings as are positive, are indicators of tendencies only. It would be unsafe to draw conclusions from meagre data, and folly to draw fine distinctions. Tendencies here observed are, then, merely indications of possible differences between groups. Where large differences have been found, further investigation is indicated. Thus, we would suggest that disarranged sentences, arithmetic, and number completion problems be included in tests designed to differentiate prospective salesmen from other business men, the hypothesis being that superiority in disarranged sentences, coupled with inferiority in arithmetic and number completion, is more often typical of salesmen.

CONCLUSIONS

Most of the business men who served as subjects in this study are far above the average American in general intelligence. Ninety-five per cent of the group have an A or B intelligence rating, indicating how rare it is for a man of only average intelligence to achieve a degree of business success comparable with the success of this group. These men are not only more intelligent, but they are on the whole superior also in business success.

Within this selected group, success in business, as estimated from items on a personal history record, does not correlate with intelligence as measured by a fifteen-minute group test.

The salesmen, as a group, were more proficient upon disarranged sentence questions than were the executives. The executives, on the other hand, were more proficient upon arithmetic and number completion questions. Proficiency on the arithmetic questions shows a negative correlation with schooling beyond grammar school. Proficiency in opposites differentiates the occupational groups not at all, but shows some correlation with schooling.

Business men who make superior test scores are more apt to reply to a personal history questionnaire.

Relative success in business can be estimated only with moderate reliability from data obtained on a typical personal history record form. Better criteria of business success are wanted.

The negative correlation of −0.35, P.E. ±0.07 between age and mental test score should not be construed as unambiguous, since the group probably contained a selection of brighter young men and less bright older men.

Possibly some factor of selection may also account, in part, for the interesting correlation between years of schooling and test score: +44, P.E. ±0.06. To some degree, the brighter the boy, the longer he tends to stay in school before entering on a business career. Schooling does not, however, show a significant correlation with the criterion of business success.

Better criteria of success are required, as well as more severe and thorough intelligence examinations, in order to measure with accuracy the share which mental alertness contributes to accomplishment in business. But the evidence in hand suggests that superiority in intelligence, above a certain minimum, contributes relatively less to business success than does superiority in several non-intellectual traits of personality.

EXPERIMENTAL STUDIES IN VOCAL EXPRESSION

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I. THE PITCH FACTOR IN VOCAL EXPRESSION

In the year of 1918–1919 there was registered in the graduate school of the University of Wisconsin, as a candidate for an advanced degree in Speech, a man whose voice was a striking example of monopitch. The man was about thirty years of age, had been a successful school administrator in a large city, and was very keen intellectually. In an attempt to find some adequate cause for the peculiar vocal limitations of this student, his sense of pitch was tested in the laboratory and it was found that his limen of pitch discrimination was considerably above the maximum difference which can be measured with an ordinary set of tuning forks. A difference of 30 d.v. (435 to 465) was not perceptible to him.

Under the circumstances it was not difficult to draw the tentative inference that the subject's vocal monopitch was causally connected with his auditory deficiency; all a priori considerations pointed strongly in that direction. It has long been a commonplace of psychology that the ear is the guiding factor in voice. The intimate, though inadequately understood, relation of the auditory and the motor speech areas in the cortex has long been known. The absence of articulate speech in the congenitally deaf and the diminution of accuracy and skill in vocal expression invariably associated with other types of deafness, indicate the dependence of voice upon audition. For these and other reasons it has been supposed that vocal expression must be in some sense a function of auditory processes. Scripture merely expresses the consensus of opinion among psychologists when he says: "The sensory-motor control is generally muscular and auditory. The learning of speech consists largely in forming connections between the motor sensations and the auditory ones."[1] Seashore says: "All this wonderful control of pitch in the speaking voice is conditioned upon the presence of capacity to hear pitch."[2] This investigation was begun as an attempt to add something to the understanding of this ear-voice relationship and, despite the side excursions into other fields, this problem has remained central throughout the studies.

The unsolved problems of vocal expression are legion. One can never be sure as to the value of the detached facts which are likely to appear in the course of pioneer experimentation in any field. Only when a science has reached a considerable degree of advancement can results be assessed finally and with assurance. The value of negative results should not be overlooked; many times it may be quite as important to learn that an alleged relationship does *not* exist as that it *does*. Any experimental cultivation of the field of vocal expression is likely to uncover facts which, although not immediately useful, at some later stage in the development of the science may be synthesized and appraised.

The phonautograph

According to Scripture, "The first attempt at recording speech was made by Scott in 1856."[3] Scott's notion was that by modelling his apparatus upon the mechanism of the human ear he might get a graphic record of air vibrations. His account of his early experiments was published in 1861 under the title, "Inscription automatique de sons de l'air au moyen d'une oreille artificielle." In 1864 he published a second article in which he named his instrument a "phonautograph." In describing this apparatus, Scripture says: "A large parabolic receiving trumpet carried at its end a thin membrane whose movement caused a small recording lever to write upon the smoked surface of the drum. The sounds of the voice passing down the receiver agitated the membrane and caused the lever to draw the speech curve on the drum."[4] This machine, was the prototype of all the phonautographs which have been used by later investigators.

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[1] E. W. Scripture, The Elements of Experimental Phonetics. Yale University Press, 1902, p. 389.

[2] C. E. Seashore, The Psychology of Musical Talent. Silver, Burdett, and Company, 1919, p. 62.

[3] E. W. Scripture, op. cit., p. 17.

About ten years after Scott's invention, Barlow began his experimental studies of the human voice. He called his recording device a "logograph."[5] Most of the modifications which have been made in the phonautograph since Scott's day have been in the diaphragm and in the writing lever. In the former, various investigators have used: rubber, cork, collodion, gold-beater's skin, and the membrana tympani. The writing lever has generally been made of glass or aluminum. Pipping substituted a diamond for the glass thread. Among those who have worked with the phonautograph, Scripture mentions: Koenig, Schneebeli, C. Blake, Preece, Stroh, Hensen, Wendeler, Martens, Hermann, E. Blake, Chavanon, Rigollot, Lebedeff, Samojloff, and Rousselot. Readers who may be interested in a detailed bibliography on the phonautograph will find the principal materials cited in Scripture's *The Elements of Experimental Phonetics*, pages 17 to 31.

The phonautograph used in these studies was designed and constructed by Dr. C. L. Hull and myself in the psychological laboratory at the University of Wisconsin. There were in the instrument no essential departures from the typical phonautographs which have just been mentioned. We used a kymograph drum which was rotated by a small electric motor of variable speed. Upon a rack and pinion support[6] were mounted the tambour carrying the glass writing lever, and time-marker controlled by a large electrically maintained tuning fork set to break the circuit twenty times per second. As the subjects spoke into the mouth-piece the experimenter lowered the writing lever and the time-marker on the drum by turning the thumb-screw on the support. Thus the tracings were made to form descending spirals on the smoked paper. The drum could be rotated at whatever speed seemed most desirable in any given case. If the speed was reduced, the tracing was made small and laterally compact; if the speed was increased, the tracing was drawn out and laterally magnified. The use of the time-marker made it possible to vary the speed of the drum without modifying the essential character of the tracing.

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[4] E. W. Scripture, op cit., p. 17.

[5] Barlow, *On the pneumatic action which accompanies the articulation of sounds of the human voice, as exhibited by a recording instrument.* Proc. Roy. Soc. London, 1874, xxii, p. 277.

[6] Universal Support, E. Zimmerman Leipzig. C. H. Stoelting Co., Chicago.

The most delicate task in the building of the apparatus was constructing and mounting the writing lever. This was made from an ordinary solid glass rod which was heated over a Bunsen burner until it was molten and then quickly drawn out into a very slender filament. It was found to be desirable that the lever should taper slightly and uniformly; if the tapering was irregular, the segmental vibrations of the filament were too much intensified. When first drawn out, the lever was straight from end to end. The writing point, which had to work in vertical movements parallel to the side of the drum, was made by holding the smaller end of the filament at some distance above the gas flame until the end was heated to degree at which it crooked sharply downward from its own weight. Then the point was removed farther from the flame until it became molten again and formed a minute drop or ball at its extreme tip. This ball minimized the friction of the writing point on the smoked paper and produced a more satisfactory tracing than was otherwise possible.

The face of the tambour was covered with a piece of dental rubber dam stretched to a moderate degree of tension and held in place by a rubber band which drew it into a groove in the sides of the tambour. The optimum tension of the membrane had to be determined by trial and error. Upon this membrane, attached to it by a single drop of glue, with the bend of the point in a plane parallel to the top of the tambour, was mounted the writing lever.

When the phonautograph had been constructed, the first question to be answered was: How reliable are the tracings which it produces; how accurately do they present to the eye the physical character of the sounds for which they stand? On this matter Scripture expressed the following opinion, in 1902:

> It is sometimes said that the speech machines do not faithfully record the vibrations of the air; this is true to a certain extent. The speaking tube and the diaphragm reinforce or weaken some of the tones, but the influence is chiefly on the very high ones. . . . . The friction of the recording point greatly reduces the size of the vibrations and modifies them chiefly by rounding off the corners. The inertia of the recording lever also has some influence. Just how much detail has been lost, and how much distortion has occurred cannot be known with machines of this phonautograph type because the records cannot be turned back into speech.[7]

Four years later, a great deal of experimentation having intervened, he concluded that the phonautograph had no value as a recorder of *quality* or *timbre*, and that it was useful for the study of vocal *pitch* changes only.[8]

In some of the voice tracings obtained in the present studies, there seemed to be a considerable amount of rather interesting looking detail of wave form. However, careful observation tended to corroborate Scripture's judgment as to the impossibility of making a qualitative analysis of vocal sound through phonautographic records. The conclusions of earlier investigators as to wave form, phonetic elements, etc., are of exceedingly doubtful value.

So far as the element of *intensity* is concerned, the case against the phonautograph is even clearer. It was obvious that the writing lever of our instrument responded far more sensitively to certain vibration rates than to others. The degree of tension of the diaphragm, the length and weight of the lever, the quality of the tone; all seemed to produce distortion in the record. Miller holds that, due to the factors of friction and momentum, Koenig's tracings are worthless with respect to both *quality* and *intensity*.[9]

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[7] E. W. Scripture, op. cit., p. 30.

[8] E. W. Scripture, Researches in experimental phonetics. Carnegie Institute Publications, 1906, p. 13.

Two elements of sound remain clearly within reach of phonautographic analysis: *time* and *pitch*. These two constitute "the melody of voice" which Scripture concluded might be studied with the apparatus. This limitation of our investigation to the *time* and *pitch* factors in vocal expression is not so serious as might at first appear. *Pitch* is indissolubly bound up with *quality* and *intensity*. Seashore says, "The experience of tone is the experience of pitch."[10] Watt says, "The whole interest of the psychology of the auditory attributes must obviously center on pitch."[11] And again, "The most characteristic difference between tones is undoubtedly given by their pitch, and it is more or less natural to think that hearing several pitches means hearing several tones."[12] Clearly then, a study of the pitch element in vocal expression should result in the discovery of some significant facts.

But was our phonautograph a reliable recorder of vocal pitch? First the instrument was tested as to its accuracy in recording the pitches of several standard tuning forks. The modus operandi was as follows: A tin writing point was mounted in wax on one prong of a fork; the fork was struck upon the beater and then while the writing point on the fork was placed in contact with the smoked paper on the drum, the other prong of the fork was touched lightly against a rubber drum-head which had been stretched over the bell of the glass mouth-piece. This test was made for forks 128, 256, 320, 512, 1024 d.v., and for several others both higher and lower than the limits of vocal pitch. In every case, a comparison of the parallel tracings showed that they were absolutely identical in vibration rate. Counting the number of vibrations per second as marked off on the time line was an easy and certain check on the accuracy of the timing device.

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[9] D. C. Miller, The Science of Musical Sounds. Macmillan and Co., 1916, p. 73.

[10] C. E. Seashore, op. cit., p. 30.

[11] H. J. Watt, The Psychology of Sound. Cambridge University Press, 1917, p. 20.

[12] Ibid., p. 56.

The control of vocal pitch and the memory for pitch

Having established the reliability of the phonautograph as a recorder of pitch, we were ready to use the instrument for the discovery of significant facts about vocal pitch. To that end, two groups of subjects were chosen and studied: *first, as to their control of vocal pitch; second, as to their memory for pitch, and finally, as to the character and amount of their inflectional modulation in the utterance of a selected bit of verse.*

The first subjects were 20 young women students in an elementary speech class. Their training in vocal expression and in music was substantially uniform. These subjects were first tested for pitch discrimination; a set of standard tuning forks was used, the testing was necessarily individual, and the right and wrong case method was employed. The limen of pitch discrimination for each subject is shown in table 1.

The subjects were then familiarized with the phonautograph and with the technique of making a record. When this had been accomplished, a tuning fork (320 d.v.) was struck on the beater and held in close proximity to the ear of the subject who was asked to hum the note of the fork. The record was made when the subject announced that she felt reasonably certain of being on the correct pitch.

The vibrations in each of twenty consecutive divisions on the tracing were counted. (As has been explained, each division represents $\frac{1}{20}$ of a second.) The total amount of deviation from the standard was computed by adding the deviations in each of the twenty divisions; the deviation in a given division being the difference between the number of vibrations in the tracing and 16 d.v. which represented the rate of the fork which was used. The total deviations of the several subjects may be seen in table 1. It will be noted that the subject showing the greatest accuracy is no. 5 who varied not a jot from the norm. The most inaccurate subject was no. 1 whose total deviation was 32 d.v. The average amount of deviation for the group was 6.07 d.v. per second.

TABLE I

Control of vocal pitch and memory for pitch (20 women)

SUBJECTS	LIMEN OF PITCH DISCRIMINATION MEASURED BY FORKS	AVERAGE PITCH OF SYNCHRONOUS REPRODUCTION FROM FORK 320 D.V.	VARIATION FROM NORM IN SYNCHRONOUS REPRODUCTION	VARIATION FROM NORM AFTER *FIVE-MINUTE INTERVAL*	VARIATION FROM NORM AFTER *TEN-MINUTE INTERVAL*
	d.v.	*d.v.*	*d.v.*	*d.v.*	*d.v.*
1	12.0	288.0	32.0	38.5	20.0
2	4.0	319.0	4.0	13.5	17.0
3	2.0	317.5	3.5	10.0	5.0
4	6.0	310.5	5.5	15.5	8.0
5	2.0	320.0	0.0	2.0	7.5
6	3.0	317.0	3.0	11.0	20.0
7	4.0	318.5	1.5	8.0	13.0
8	6.0	304.5	15.5	5.5	10.5
9	0.5	316.5	3.5	6.0	2.5
10	5.0	302.0	18.5	22.5	14.0
11	1.5	320.5*	0.5	4.0	2.0
12	1.5	318.0	2.0	1.5	7.0
13	0.5	316.0	4.0	26.5	28.0
14	0.5	316.5	3.5	11.5	4.5
15	2.0	315.5	4.5	1.0	7.0
16	0.5	316.5	3.5	7.5	12.5
17	1.5	317.5	3.5	3.0	4.5
18	5.0	314.5	5.5	16.5	21.0
19	1.0	317.0	4.0	17.5	14.0
20	4.0	316.5	3.5	4.0	6.0
Totals.....	63	6201	121.5	221.5	224
Means.....	3.01	314.55	6.07	11.07	11.4
A.D........	2.05	4.95	4.72	7.12	5.9
P.E.M......			0.89	1.34	

* Above pitch of fork.

The procedure just described was followed with 23 male subjects, also students in a beginning speech course; with these differences: whereas the sense of pitch in the case of the first group of subjects was measured with tuning forks, the Seashore phonograph discs were used for the second group, and the pitch norm was furnished by a 128 d.v. fork. Table 2 shows the records of these 23 men.

TABLE 2

Control of vocal pitch and memory for pitch (23 men)

SUBJECTS	PERCENTAGE SCORE ON SENSE OF PITCH (SEASHORE RECORDS)	AVERAGE PITCH OF SYNCHRONOUS REPRODUCTION OF FORK 128 D.V.	VARIATION FROM NORM IN SYNCHRONOUS REPRODUCTION	VARIATION FROM NORM AFTER FIVE-MINUTE INTERVAL
		d.v.	*d.v.*	*d.v.*
1	86	135.5*	7.5	5.0
2	63	140.0*	12.5	1.0
3	85	98.0	30.0	2.0
4	63	130.0*	2.0	44.5
5	74	150.5*	28.5	36.0
6	85	127.0	1.0	18.0
7	75	122.5	5.5	3.5
8	82	127.0	1.0	4.5
9	82	126.5	1.5	1.5
10	89	129.5*	1.5	2.0
11	94	141.5*	13.5	34.5
12	83	124.0	4.0	0.5
13	84	105.0	23.0	8.5
14	88	126.5	1.5	4.5
15	60	147.5*	21.5	21.0
16	53	124.0	4.0	3.0
17	74	123.0	5.0	3.0
18	83	128.5*	0.5	1.0
19	70	94.0	34.0	33.0
20	87	126.5	1.5	10.5
21	90	126.0	2.0	23.0
22	65	127.0	1.0	26.0
23	76	124.0	4.0	12.5
Totals........		2910	206.5	299
Means........		126.52	8.97	13
A.D..........		8.54	8.71	11.47
P.E.$_M$........			1.53	2.02

* Above pitch of fork.

The best record among the men was made by subject 18 whose total variation from the norm was 0.5 d.v. The average total deviation for the group of men was somewhat higher than that for the group of women; 8.97 as against 6.07. The average deviations of the figures in the third columns of tables 1 and 2 indicate that there is less variation among the women than among the men. All of the women, with the exception of no. 11 who was slightly sharp and no. 5 who was absolutely on the key, were flat. Eight of the men were sharp and 15 of them were flat in their synchronous reproduction of the pitch.

It might be supposed that accuracy in producing vocal pitch is a direct function of the sense of pitch. The coefficient of correlation (Pearson's) between sense of pitch and accuracy in the production of vocal pitch was found to be +0.808 for the women and +0.081 for the men. The cause of the disparity between these two coefficients is not clear. As has been said, the measures of pitch discrimination for the first group were made individually with tuning forks, whereas those for the second group were made with the Seashore phonograph records. It should also be said that in the latter case the test was given only once and practice effects may have destroyed its validity. Then, too, the number of subjects in the groups was so small as to render the reliability of the coefficients very dubious.

In the tracings of vocal pitch there was practically no fluctuation for the one second of time.

After a subject had done the best he could to reproduce the pitch of a tuning fork synchronously with hearing it, he was asked to sit quietly for an interval and then to hum from memory the tone which he had heard. The women were asked to do this after an interval of five minutes and again after a second interval of like duration. The results of the first memory trial are shown in the fourth column of table 1. The most accurate record was made by subject 15 whose total deviation was 1 d.v. Strangely enough, this subject was more accurate in reproducing the pitch of the fork from memory than she had been when it was sounding in her ear. The most inaccurate record, as in the former instance, was made by subject 1 whose total deviation had increased to 38.5 d.v. The average amount of deviation for the 20 subjects had risen from 6.07 to 11.07. Four of the 20 were closer to the norm from memory than they were when they were listening to the fork.

The results of the second memory test are shown in column 5 of table 1. The average of this column is 11.4, an inconsiderable increase over the average of 11.07 for the first memory trial. After this second interval, subjects 1, 8, 9, 10 did better than they did when they were actually hearing the fork. Subjects 1, 3, 4, 9, 10, 11, 14, 19, a surprisingly large proportion of the group, were more accurate after the lapse of ten minutes than they were after but five minutes. The average loss in accuracy after the first interval was exactly 5 d.v.; after the second interval it had risen very slightly to 5.325 d.v. Sharping and flatting were not differentiated in computing total amounts of deviation.

The group of men were tested after only one interval of waiting. The fourth column of table 2 shows their memory records. Almost 50 per cent of the group, subjects 1, 2, 3, 7, 12, 13, 15, 16, 17, 19, showed the anomalous tendency to get closer to the norm when humming from memory than they could when they were hearing the pitch sounded. Yet the average for the group rose from 8.97 to 13, or an average loss in accuracy of slightly more than 4 d.v. The most accurate memory record was made by subject 12; this was just equal to the best record in the 3rd column. The least accurate memory record was that of subject 4 whose score was just about 50 per cent worse than the poorest score made in the synchronous trials.

One very clear indication from this rather inadequate study is that individuals differ very widely in ability to produce vocally a tone which they are hearing or have heard. A careful examination of the data presented in tables 1 and 2 may cause a good many questions to arise. Most of them must await more experimentation before they can be answered satisfactorily. It would seem that more evidence may be needed before we can accept unreservedly Seashore's statements concerning the comparative accuracy of men and women in voice control as indicated by pitch singing. He says: "Men and women sing in their respective ranges with equal accuracy, vibration for vibration of error."[13] In the present tests, the women seem to have better memory for pitch and greater pitch control than the men have. Of course the small number of subjects again warns us not to be too sure of our conclusions on this point. The reliability of the differences between men and women in vocal control and memory for pitch is very low. In vocal control the difference is 2.9, the P.E. is 1.77, and the formula for reliability $\frac{D}{(\text{P.E.}_D)}$ yields 1.63. The coefficient of reliability is therefore 0.8671. In memory for pitch the difference is 1.93, the P.E. is 1.83, and the coefficient of reliability is 0.7601.[14]

Inflectional modulation

We shall now attempt to indicate some of the ways in which the use of the phonautograph may shed light upon the many interesting problems of inflectional modulation in vocal expression. The experiments on this matter utilized subjects from the two groups who had been studied as to pitch memory and control; 19 of the 20 women, and all of the 23 men.

First, the material to be uttered vocally had to be selected. Since the investigation was to be focussed upon pitch, it was decided that the prime requisite of the language should be the prominence of the inflectional element in its effective vocal rendition. Several bits of literary material, both prose and verse, were tried out. In these preliminary trials, the fallibility of the unaided ear was shown repeatedly. A few words which seemed to be spoken effectively only with a relatively large amount of inflection, when recorded by the phonautograph, often revealed little pitch change. Finally, Austin

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[13] C. E. Seashore, op. cit., p. 100.

[14] E. L. Thorndike, Mental and Social Measurements. Columbia University, 1913, p. 200.

Dobson's dialogue in verse, "Tu Quoque," was suggested. Several excerpts from this seemed to fill the bill better than anything else had done, and one of them, the words, *"Really! You would? Why, Frank, you're quite delightful,"* was defi-

Vocal Reproductions of Pitch of Tuning Forks

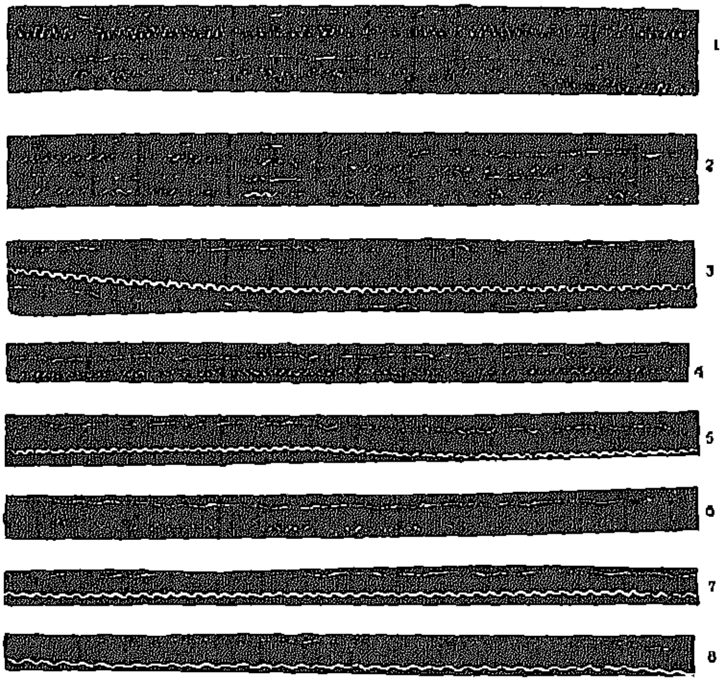


FIG. 1

1= Female Subject No. 2 Vocal Reproduction of Fork 320 d.v.
2= " " " 18 " " " " " "
3= " " " 1 " " " " " "
4= " " " 15 " " " " " "
5= Male " " 7 " " " " 128 "
6= " " " 1 " " " " " "
7= " " " 13 " " " " " "
8= " " " 12 " " " " " "

nitely chosen. The effective utterance of this material was found to involve rather pronounced steps and slides in pitch.

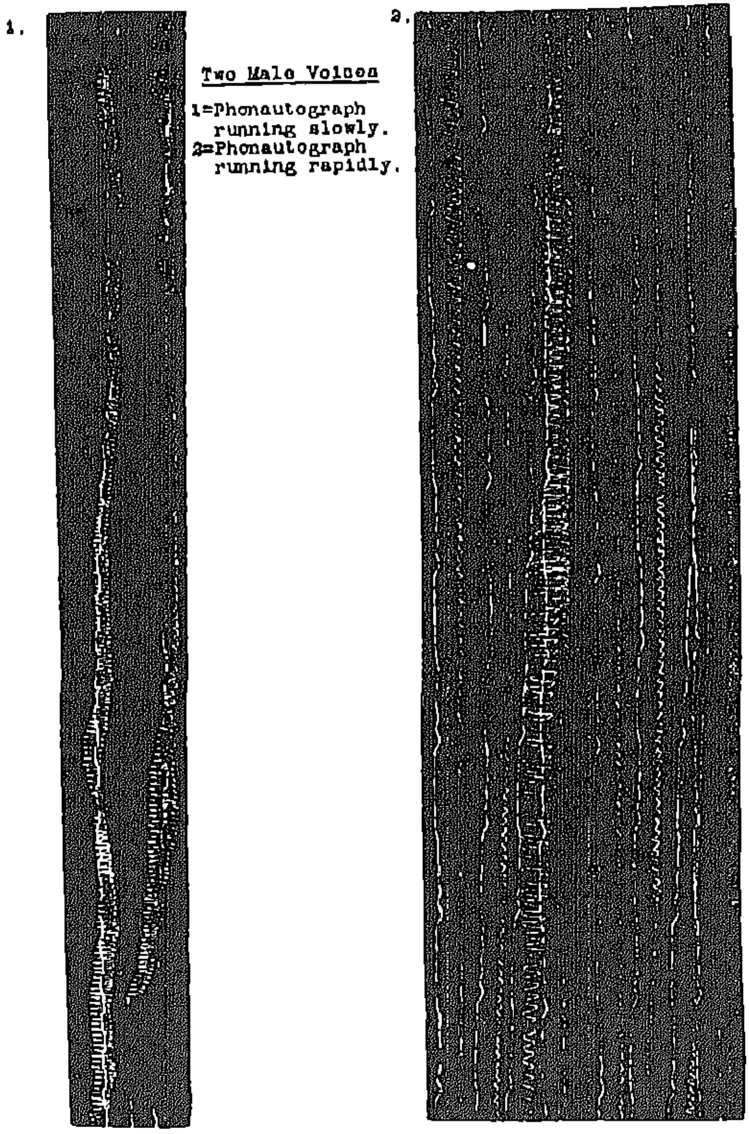
Each subject was instructed to read the entire poem silently and to ask the experimenter for the explanation of any obscure portions. After this, the subject read the whole poem aloud to the experimenter endeavoring to follow the instructions: "Put all the feeling you can into your rendition." The subjects had learned to use the phonautograph properly in the previous experiments. Now, all was in readiness for actually making the record. The subject was asked to look back over the poem, to get the context clearly in mind, and then to speak the selected words into the recorder in such a way as to express all possible meaning. Unless a given tracing appeared to be mechanically perfect, the process was repeated until a perfect record had been secured.

Lest some one may wonder why such a small amount of material was used, let it be said that the utterance of that much, with the machine running at the optimum speed, completely filled the paper on the drum. The work of analyzing these tracings was considerable; some of the records presented the problem of counting not less than 20 feet of vibrations, and this resulted from the vocalization of eight words!

The analysis consisted in starting at the beginning of a voice tracing, counting the vibrations within each time unit, ($\frac{1}{25}$ second), and tabulating these numbers as the data to be used in plotting the melody curves and in determining mean pitch, pitch span, etc. So far the procedure tallied closely with that used by Scripture, Merry, et al.

At first approach, the graphic representation of vocal melody seems to be a relatively simple matter. However, one does not get far before meeting with unsuspected intricacies and complexities. All of the melody curves in Scripture's two books are plotted on ordinary squared paper; time units are laid off on the horizontal base line, and equal steps on the vertical line represent the different pitch levels touched by the voice. Scripture neither explains nor attempts to justify his method.

Portions of Two Typical Phonautographic Voice Tracings



Two Male Voices

1=Phonautograph running slowly.
2=Phonautograph running rapidly.

FIG. 2

Bradley[15] and Merry[16] argue for the use of the musical octave as the proper procedure in presenting to the eye the auditory experience of inflectional changes. Bradley's statement of the case is somewhat obscure, but Merry's is clear. Merry says:

> Various methods have been employed in attempting to represent pitch changes in speech. If we represent the data in terms of vibrations only, the facts as experienced will be relatively distorted because a small number of vibrations at a low pitch may mean as much in tonal perception as a large number at a higher pitch. The musical staff furnishes the truest proportions of pitch change at all pitch levels. We have, therefore, adopted the plan of making all graphs on paper in units of semitones, designating in the margin the vibration frequency for each semitone.

Seashore seems, by implication at least, to take substantially the same position when he says: "When conventionally a man and a woman sing the same note, the woman sings an octave higher than the man, and we can detect an error in the woman's singing with twice the precision that we can detect it in the man's."[17] The truth of this proposition evidently rests upon the correctness of the assumption that the ear recognizes a change of a given number of vibrations as of different magnitudes in different registers; e.g., a change from 150 to 160 d.v. would seem twice as great as a change from 300 to 310 d.v. Conversely, a change of ten vibrations at 300 d.v. would seem only half as great as a change of the same number of vibrations at 150 d.v.

A perusal of the literature leaves one in a state of uncertainty as to what the facts really are. Stumpf is quoted by Watt as asserting that the field of tonal distance is one "in which clear results are absolutely out of the question."[18] It is quite obvious that much of the confusion has come from the temptation to assume that the mathematics of the musical scale may be laid down in the mind as adequately descriptive of the perception of sound. The physics and mathematics of pitch must not be substituted for the psychology of pitch.

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[15] C. B. Bradley, A method of plotting the inflections of the voice. Science, 1916, 44, pp. 3-5.

[16] G. N. Merry, Voice inflection in speech. Psychological Monographs, xxxi, no. 1, p. 214.

[17] C. E. Seashore, op. cit., p. 72.

[18] C. Stumpf, Tonpsychologie, vol. 1, 1883, p. 248.

Watt[19] says that much of the unclearness in the psychology of sound arises from the confusion of two concepts, one of which he calls "interval," and the other, "distance." He contends that the octave is essentially and constantly an "interval," established solely upon the basis of the phenomenon of tonal fusion. He says: "the octave as a difference in pitches is not by any means equal throughout the musical range." Again:

> We must be careful not to be misled by the constancy of physical ratios. How do we know that one ratio offers the same possibility of distance in the various parts of the range of pitches? . . . . The only proper basis for the judgment of distances is distance itself. . . . The differential threshold of pitch does not conform to Weber's law.

In support of this contention Watt cites the results of Stuecker's tests[20] as to the differential threshold of pitch. The subjects were 30 professional musicians. Similar material from Meyer, Dunlap, et al. is mentioned.

To add to our difficulty, while it may be relatively easy to determine liminal differences at various points on the scale, the problem is not so simple where the pitch distance is decidedly greater than liminal. This is the case with the distances involved in plotting vocal melody curves. It was demonstrated by Merkel, working in Wundt's laboratory, that the differences for which Weber's law is valid are liminal, and that the addition of a constant amount of stimulation beyond this just perceptible difference seems the same at any point in the scale. Then too, the variable time factor in vocal expression upsets all of our calculations as to the correct psychological measure of pitch changes. Scripture calls attention to the disturbing element of time in inflection. He cites Marten's experiment with the falling pitch of a siren. The tone was dropped at different rates and it was found that the number of different pitches which could be detected by trained musical ears is a function of the rate of change.[21] In another connection Scripture says: "Owing to inaccuracies in sensation, sounds in close succession may differ without the difference being perceived."[22]

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[19] H. J. Watt, op. cit., pp. 75-82.

[20] N. S. Stuecker, Ueber die Unterschiedsempfindlichkeit fur Tonhoehen in Verschiedenen Tonregionen. Zetschr. Sinnesphysiol., 1908, 42, pp. 392-408.

From what has been said, it is apparent that the graphic representation of vocal inflection presents problems which seem to baffle solution. If we accept Stuecker's findings, and if we assume that pitch distance at different points on the scale is determined by the threshold at these points, it then seems probable that Scripture's method of plotting melody curves is more accurately representative of the facts of auditory perception than is a method which reduces the distance by one-half for each octave of rise in pitch. It is to be noted, however, that Stuecker did find some increase in liminal distance as we go up the scale within the range of the voice in speech, if we include both the male and the female voice. The threshold was determined as 0.4 at 70, 125, and 250 d.v.; 0.65 at 417 d.v.; and 0.9 at 834 d.v.

After plotting all of the data on ordinary squared paper, it was finally decided to use semi-logarithmic graph paper. Whether the melody curves thus plotted give an absolutely accurate picture of the facts of auditory perception or not, the method is very convenient, it is probably as accurate as any other method, and it is a compromise between the two other methods which have been used most generally. At least it furnishes an apparently invulnerable basis for the principal conclusions which are to be drawn from the data here presented.

After the vibrations within each $\frac{1}{10}$ second had been counted and tabulated, the measures were graphed on the semi-logarithmic paper; the units on the base line being $\frac{1}{20}$ second and the units on the vertical axis being 1 d.v. The curves were plotted without any smoothing. In connection with this matter, Merry concluded that he should plot his raw readings without smoothing. His reason seems valid. He says:

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[21] E. W. Scripture, Elements of Experimental Phonetics, p. 473.

[22] Ibid., p. 199.

> . . . . the true contour of a curve would perhaps be more nearly right if it were smoothed in accordance with conventional methods of smoothing. The merit of the method adopted is that it shows the actual, individual readings and enables any interpreter or future experimenter to decide what type of smoothing should take place.[23]

Herewith are included eight typical melody curves; four of the women subjects' and four of the men's.

When the curves had all been plotted, it was felt that it was necessary to establish some simple numerical index for the amount of inflectional change in a curve. The object was to develop some suitable common measure which would make possible to comparative study of the inflectional patterns of different individuals and of the two groups of subjects.

The graphs did not indicate the pauses in speaking; they show merely the rise and fall of pitch during actual vocalization. It seems rather reasonable to suppose that the number and the length of the pauses may not be unimportant in conditioning the perception of melody, but, not knowing how to appraise this factor, it was thought best to ignore it altogether.

The time consumed in the actual vocalization varied greatly among the subjects. Table 3 shows the length of the curves for the 42 subjects. The averages for the two columns indicate the women exceed the men by nearly 30 per cent in the amount of time used in vocalizing the same language. If, as seems probable, the effectiveness of inflectional change is in inverse ratio to the speed with which it occurs, then the decided advantage would be with the slower utterance of the women subjects.

It was at first thought that the most useful index of inflection might be the *range* or *span* between the lowest and the

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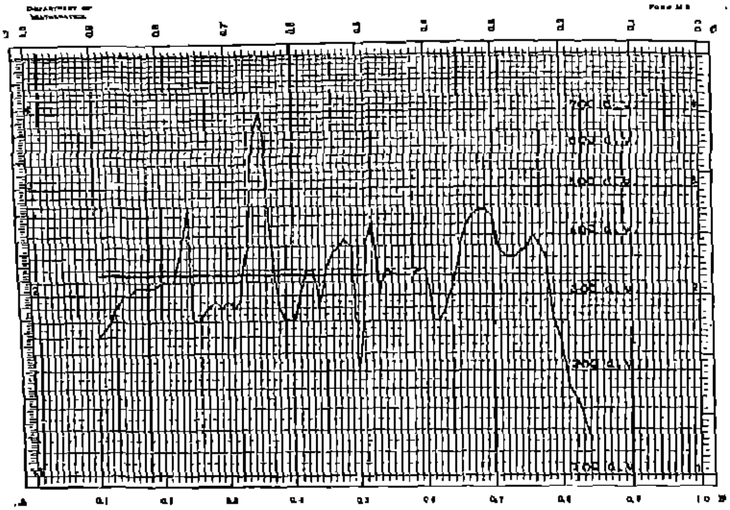
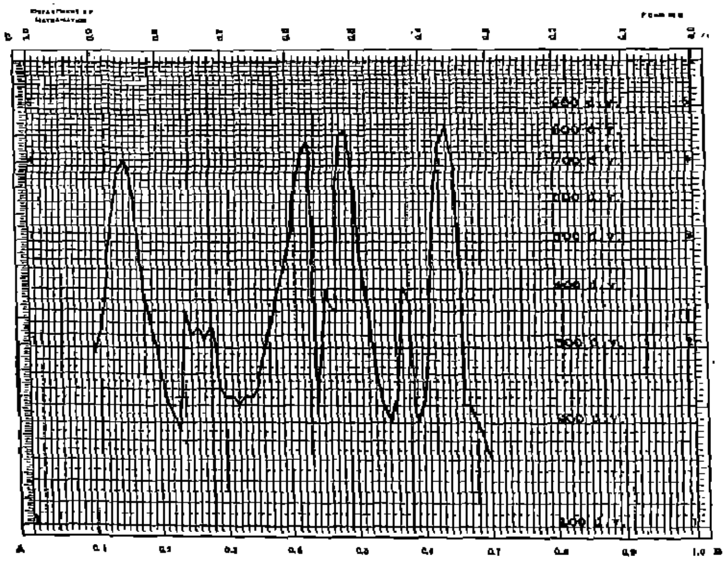
[23] G. N. Merry, op. cit., p. 214.

I



Subject No. 2 in Group of Women

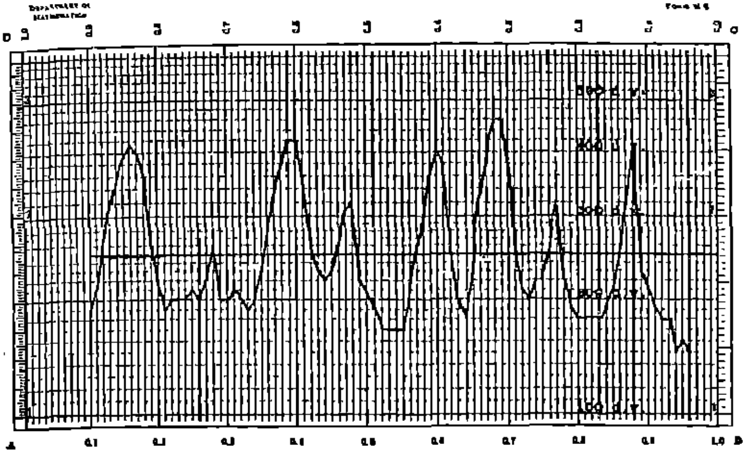
II



Subject No. 5 in Group of Women

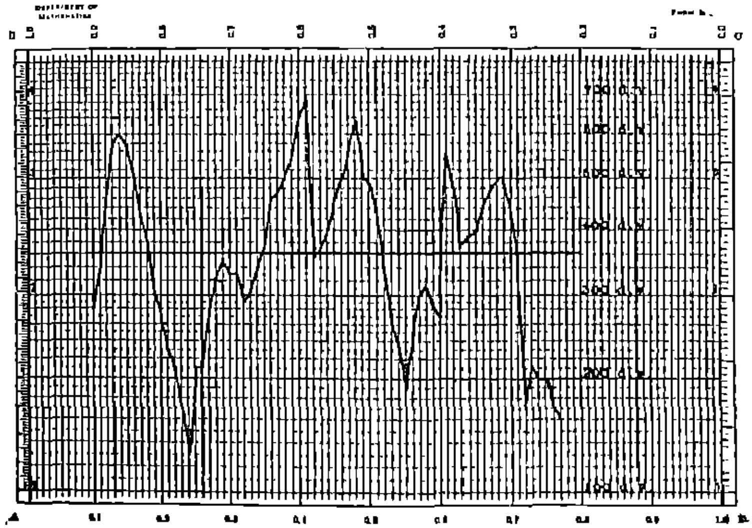
FIG. 3

III



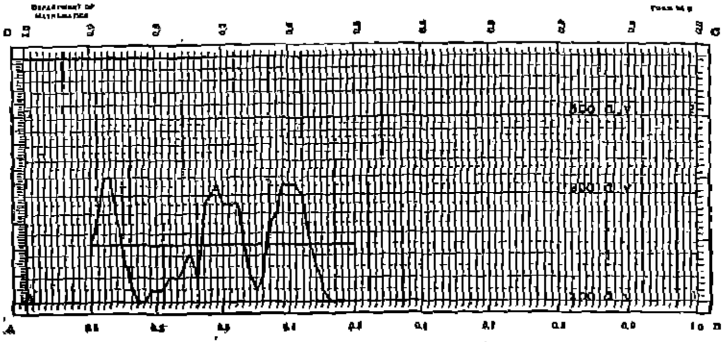
Subject No. 7 in Group of Women

IV



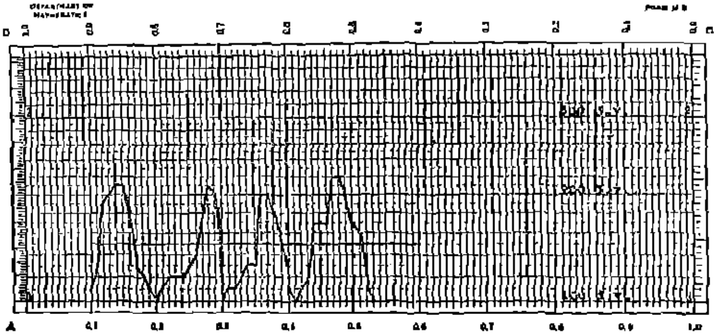
Subject No. 11 in Group of Women

FIG. 3 (continued)



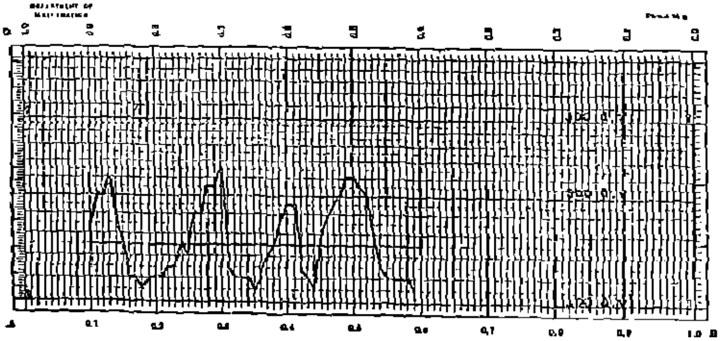
Subject No. 3 in Group of Men

VI



Subject No. 4 in Group of Men

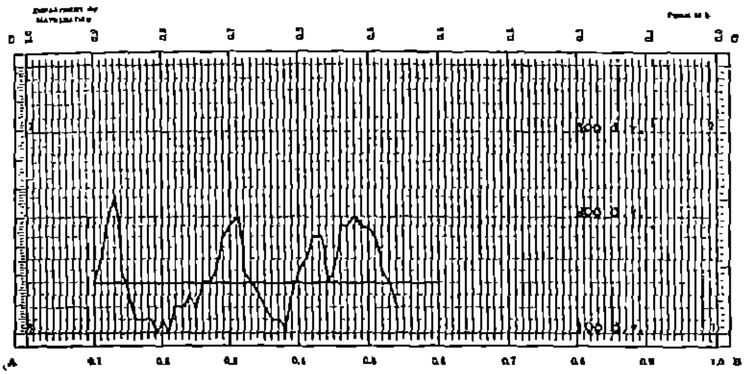
VII



Subject No. 5 in Group of Men

Fig. 3 (continued)

VIII



Subject No. 9 in Group of Men

Fig. 3 (continued)

highest pitches shown in a given vocalization. There is a great deal of variation among the subjects in this respect, and of course such an index is commended to us by the ease with which it may be computed. Upon more careful observation, however, it was found that this measure seemed to depend too largely upon chance in the rather freakish rise and fall of pitch in certain cases to be a satisfactory index of total inflectional change.

Several other possible indices were tried out. Those which seemed to be most fairly representative of the amount of pitch change were three in number. First, there was *the index of total deviation.* This was computed by summing the deviations, within the various time units, from the arithmetic mean. This method was used in measuring memory for pitch and vocal pitch control, as explained in the preceding section. Second, there was *the index of total fluctuation.* This index is figured more easily than the former; the number of vibrations of change from one time unit to the succeeding is recorded and the sum of these changes constitutes the index. Third, the one which was finally adopted, was *the curve area* as measured by the planimeter.

TABLE 3

Time used in vocalizing material for melody study (19 women, 23 men)

(Time in $\frac{1}{25}$ second)

SUBJECTS	ACTUAL UTTERANCE		PAUSES	
	Women	Men	Women	Men
1	50	24	14	10
2	73	38	32	13
3	41	40	21	15
4	52	36	26	41
5	60	43	30	15
6	63	47	37	10
7	87	49	32	32
8	47	47	34	4
9	50	50	27	12
10	39	45	20	31
11	67	40	37	19
12	45	30	16	21
13	56	60	17	25
14	34	34	30	17
15	88	36	52	31
16	53	37	40	15
17	65	48	19	45
18	51	49	32	12
19		41		22
20	57	45	15	20
21		82		33
22		37		27
23		42		16
Totals	1078	1009	540	504
Means	56.73	43.87	28.42	21.9
A.D.	10	8.04	7.62	8.54
P.E.$_M$	1.93	1.4		
D	12.86			
P.E.$_D$	2.38			

$\frac{D}{P.E._D} = 5.4$; coefficient of reliability = 0.99986*

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* E. L. Thorndike, op. cit., p. 200.

TABLE 4

Amount of inflectional modulation (19 women, 23 men)

SUBJECTS	WOMEN				MEN	
	Pitch span	Total Deviation	Total Fluctuation	Curve area	Pitch span	Curve area
	d.v.	*d.v.*	*d.v.*	*square inch*	*d.v.*	*square inch*
1	250	118	78	1.37	260	1.13
2	570	245	144	2.84	100	1.38
3	400	219	122	2.20	120	1.48
4	350	107	140	2.10	120	1.43
5	680	482	273	5.15	120	1.59
6	370	330	134	4.06	60	0.88
7	320	207	154	4.25	90	0.78
8	340	172	105	2.44	170	2.78
9	350	184	114	2.25	120	1.37
10	330	148	92	1.72	80	0.91
11	560	385	100	4.53	200	5.70
12	200	100	63	1.10	100	0.96
13	330	185	123	2.18	130	1.33
14	220	108	62	1.21	90	0.70
15	440	310	185	4.10	250	2.18
16	530	214	134	2.39	100	1.05
17	460	244	146	3.20	140	1.60
18	280	144	87	1.75	150	1.10
19					170	0.98
20	420	225	96	2.74	100	1.40
21					100	1.25
22					60	0.93
23					90	0.73
Totals......	7400	4322	2448	51.76	3070	33.53
Means......	380.47	227.47	128.84	2.72	133.47	1.45
A.D.........	90.30			0.9547	45.41	0.5765
$P.E._M$.......	19.08			0.180	8.01	0.101

Reliability of difference between pitch span for men and that for women: $\frac{D}{P.E._D} = 12.37$.

Reliability of difference between melody curve area for men and that for women: $\frac{D}{P.E._D} = 6.35$.

When the melody has been plotted on semi-logarithmic paper, the curve area takes into account the reduction of pitch distance as the pitch level rises. This index corresponded very closely with the other two and is much more easily obtained. Table 4 shows the pitch span, the total deviation, the total fluctuation, and the melody curve area for the 19 women; the pitch span and the melody curve area for the 23 men. Table 5 shows the average pitch of the male and female voices

TABLE 5

Average pitch of male and female voices (19 women, 23 men)

SUBJECTS	WOMEN	MEN
	d.v.	*d.v.*
1	300	320*
2	320	140
3	400*	150
4	360	150
5	380	160
6	340	110
7	250*	130
8	270	140
9	300	140
10	300	110
11	370	210
12	320	140
13	300	170
14	320	150
15	280	200
16	320	140
17	300	130
18	300	140
19		220
20	320	120
21		120
22		100*
23		110
Totals................	6050	3490
Means................	318.42	151.73

* Highest or lowest.

as computed from the data. In all of the tables, the subjects are arranged in the same order.

An examination of the data contained in tables 4 and 5, reveals some interesting sex differences in average vocal pitch and in amount of inflectional modulation. The figures in table 5 were obtained by adding the number of vibrations within the time units of the record and dividing by the number of units. The measures in each column, marked with asterisks, are the highest and lowest for the male and females voices. With the exception of the first subject among the men, the pitch registers of the two groups are mutually exclusive. The first subject in the second group had a voice of shrill falsetto pitch which was easily recognized as effeminate. The mean pitch of the male voices is 151 d.v.; that of the female voices is 318 d.v. This tallies accurately with the general impression that the average female voice is approximately one octave higher in pitch than the average male voice.

Table 4 shows how the male and the female voices compare as to the amount of inflectional modulation. The average area of the melody curves, as measured by the planimeter, is 1.4578 square inches for the men, and 2.7242 square inches for the women. Great as is this difference, it has been much reduced by plotting the curves on the semi-logarithmic paper. If the ordinary squared paper had been used, the advantage in favor of the female voices would have been just about doubled. It will be observed that the difference in the amount of inflection shown by the men and by the women is very reliable; 6.35 times its probable error.

It is true, of course, that curve area is somewhat dependent upon the rate of utterance, and we have noted that the women subjects spoke considerably more slowly than the men did (table 3). The difference in this respect is not great enough to account for the difference in curve area, and it is not to be forgotten that, since the index is to symbolize the effect of the inflection upon the ear, this very reduction in the rate of utterance which makes for an increased curve area doubtless also increases the effectiveness of the inflectional change.

The measures of pitch span show that the average female voice has a pitch span of 389.47 d.v., while the male voice has but 133.47 d.v. Again we find a marked difference in favor of the female voice, the span of which is nearly three times the span of the male voice. The difference in this case is more than twelve times the size of its probable error.

What these differences may mean with respect to effectiveness in vocal expression is yet to be determined. Woolbert, in his study of methods in reading,[24] found that the most effective reading, as determined by the criterion of retention on the part of listeners, involved relatively large amounts of pitch change. His conclusion is in line with the consensus of opinion among teachers of vocal expression. In the present studies, the results of attempts to demonstrate a relationship between the index of inflection and a group judgment of effectiveness in vocal expression were disappointing. Using the Spearman formula, the coefficient of correlation was found to be +0.15 for the women and +0.28 for the men. The number of cases is so small as to make the coefficients unreliable.

As has been said, there is practical unanimity of opinion among workers in the field of vocal expression that a considerable amount of pitch change is prerequisite to an effective use of the voice. Reasoning a priori, it would seem that the determining factor in the effective use of pitch change must be the appropriateness of its relation to the meaning of the material vocalized. It seems probable that the relationship between the amount of inflection and the degree of effectiveness in vocal expression is a one way relationship. All effective vocal expression involves a large amount of inflectional modulation; of that there seems to be little doubt. But the proposition cannot be converted simply; it is apparently not true that all vocal expression involving a large amount of pitch change is necessarily effective. There are rich possibilities yet untouched in this field.

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[24] C. H. Woolbert, Effects of various modes of reading. Journal of Applied Psychology, September 1920, pp. 162–185.

It may be interesting to compare the pitch span of the subjects in these experiments with that of some of the speakers whose phonograph records were studied by Dr. Merry.[25] It is difficult to make any comparisons of the other measures of inflection; in the nature of the case there are too many variables involved. Each of the speakers in Dr. Merry's list was uttering material different from that uttered by the others. E. H. Sothern was reading the lines of Shylock in the court room scene from *The Merchant of Venice*. Julia Marlowe was reading Portia's speech in the same scene. The others were delivering popular addresses. The pitch span of the several speakers will be shown in table 6.

TABLE 6

Pitch span of readers and speakers

(Dr. G. N. Merry's studies)

SUBJECTS	LOWEST PITCH	HIGHEST PITCH	SPAN
	d.v.	*d.v.*	*d.v.*
W. G. McAdoo	100	210	110
James Gerard	120	240	120
Franklin Roosevelt	100	250	150
Rabbi Stephen Wise	80	200	120
E. H. Sothern	100	300	200
Corinne Robinson	110	385	275
Julia Marlowe	190	430	240

Average span for men = 158.2 d.v.
Average span for women = 257.5 d.v.

Comparison of these figures with those shown in table 4, indicates that the 5 men studied by Mr. Merry have a pitch span slightly greater than the average for my second group, 158.2 d.v. as against 133.47 d.v.; while the average for the 2 women is 257.5 d.v. as compared with an average of 389.47 d.v. for my subjects. Of course the nature of the material which the several speakers were expressing vocally is so variable that no definite conclusions are to be drawn from this data.

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[25] G. N. Merry op. cit.

A MENTAL PROFILE FROM AN OMNIBUS GROUP TEST

JOHN J. B. MORGAN

State University of Iowa

In answer to the demand for simplicity in administration the omnibus test has come into existence. That it has obvious advantages no one questions. It eliminates the distasteful *stop—start* situations which some individuals report to be so disagreeable that they cannot do good work in the tests. It prevents all possibility of changes in the directions because these are incorporated in the test itself. It excludes the possibility of the examiner making a slip in his time checks. It is as near "fool-proof" as any testing method yet evolved.

This change toward simplicity of administration has been accomplished at no cost in reliability. For example, the Morgan Mental Test correlates 0.85 with individual examinations by the Stanford-Binet Scale. Its internal reliability is about 0.98. There is however one element that has been of a decided disadvantage. This is the fact that the different performances are combined in such a way that the total score tells nothing as to any particular outstanding ability or lack. While the achievement on the different tests in such an examination as the Alpha has not led to any widespread differentiation in use, there has existed the possibility of quickly determining whether the person was weakest in ability to follow directions, in the perception of relations, in information, etc. This is not true in the ordinary omnibus test. One must search through the test to determine any outstanding lack or ability.

This objection has been met in a profile devised in connection with an examination conducted at the Palmer School of Chiropractic at Davenport by the writer.

The standardization of the Morgan Mental Test has been so conducted that the items are arranged very closely in the order of difficulty from the extremely easy problem to the superior adult problem. The time allowed for the whole examination is so long that all individuals, except the superior ones, reach the level of their ability before the expiration of the time limit. This makes it largely an ability test and with the ordinary individual the point between achievement and failure is fairly sharply defined. This gradation of problems according to difficulty is a primary requisite if the profile to be described is to be of any value. Not only must the final scores be standardized but the value of each item carefully determined and its position in the test decided accordingly.

Three tests were given in this examination: First, the Morgan Mental Test; second, the word building test; and third, a test of memory span for digits. All these were included in the record which was returned for each examinee on a record-card, a sample of which is herewith given.

The problems in the Morgan Mental Test were divided into seven general groups and these were named in such a way as to be of the maximum practical value rather than in any attempt at absolute accuracy in terminology. Any such naming is bound to be defective due to the complications involved in any one type of performance; but the name in conjunction with a knowledge of the concrete performance for which the name stands is valuable.

These groups were as follows:

1. Reasoning. This includes arithmetical reasoning in the lower ranges and a modified superior adult ingenuity problem in the higher ranges with intermediate problems of logical reasoning.

2. Imagination. The simpler problems included under this caption are questions of discrimination ending with an adaptation of the Binet paper cutting test.

3. Adaptability. This series is made up entirely of mixed letters to be incorporated into a suitable word. These are solved by a trial and error method. The subject thinks of one article of men's clothing and compares it with the letters; then chooses another at random and compares it with the letters. This is continued until the proper name is found.

It has been found that the greatest handicap in the performance of this type of problem is the fact that one gets an apperceptive arrangement which persists in spite of evidence that it is incorrect. The adaptable person is the one who can quickly dismiss a wrong combination and search for another. For instance, when asked to rearrange the letters D O R O F S X many individuals think immediately of sox or odor and then try to get some modification of these. If such a suggestion persists the solution is hopeless. In other words the good forgetter can solve such a problem much more readily than the one who so falls in love with his first guess that he cannot rid himself of it.

4. Guessing ability. All the tests in this series are the familiar completion tests. By guessing we mean the ability to use faint clues to arrive at a decision as to the proper word. The parts of the sentence that are given furnish more or less obscure suggestions as to the meaning, the successful subject acts immediately on these suggestions. Guessing is not chance, it is the use of intangible bits of evidence and this is the main feature of the completion test.

5. Analytical ability. This comprises a series of number-series-completion tests.

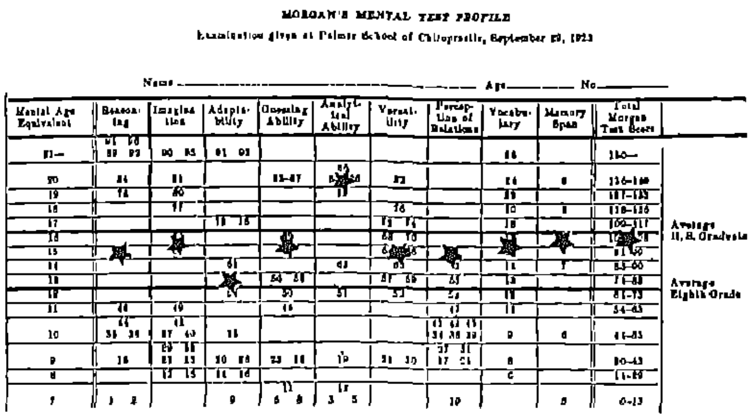
6. Versatility. The type of problem used in this series is illustrated by the following question: "What six coins add up to ten cents?" The elements in such a problem are very familiar. The way in which they must be manipulated is relatively new. The veresatile man is the one who can adapt old elements for use in a new situation.

7. Perception of relations. The tests in this group comprise a series of mixed relations.

8. Vocabulary. Under this caption was recorded the score in the word building test.

9. Memory span. Auditory memory span for digits.

The record card used to report the results of this survey has at the extreme left a column of Mental Age Equivalents. The next seven columns have numbers indicating the different items in the Morgan Mental Test. The position of the numbers opposite the Mental Age Equivalents indicate the relative difficulty of each item. The value of different performances in the Word Building and Memory Span is shown in the same manner. Finally the Total Morgan Test Scores are arranged according to Mental Age Equivalents.



MORGAN'S MENTAL TEST PROFILE

Examination given at Palmer School of Chiropractic, September 29, 1923

Name ______________ Age ______ No. ______

Mental Age Equivalent	Reasoning	Imagination	Adaptability	Guessing Ability	Analytical Ability	Versatility	Perception of Relations	Vocabulary	Memory Span	Total Morgan Test Score	
21—	91 96 89 92	90 95	91 93					18		150—	
20	84	81		82-87	85 [illegible]	83		14	9	136-149	
19	78	80			[illegible]			13		127-135	
18		77				76		10	8	118-126	
17			73 75			73 74		16		109-117	Average H. S. Graduate
16		[illegible]		[illegible]		68 70		[illegible]		[illegible]	
15						[illegible]				91-99	
14			61		63	65	[illegible]	11	7	83-90	
13				64 68		57 59	65	12		74-82	Average Eighth Grade
12			54	50	51	53	[illegible]	11		64-73	
11	44	49		46			47	11		54-63	
10	44 36 39	41 37 40	33				41 42 45 34 38 39	9	6	44-53	
9	18	29 30 21 23	20 26	23 24	19	31 35	37 31 17 21	8		30-43	
8		12 15	14 16					6		14-29	
7	1 2		9	11 6 8	17 3 5		10		5	0-13	

FIG. 1

The recording of a performance on this card is very simple:

1. Go in order through the test paper and cross off on the card the numbers corresponding to every question incorrectly answered or omitted.

2. With a rubber stamp in the shape of a star indicate the point midway between the highest correct performance and the lowest failure in each column.

3. If the tests passed in any column do not give an unbroken series, lower the point to be stamped by one test for each test failed. For example, suppose in adaptability the subject passes questions 9, 14, 16, 26, 33 and 54; and fails to do correctly tests 20, 61, 73, 75, 91 and 93. If it had not been for

the failure in test 20 the star would have been midway between 54 and 61 giving the equivalent of the mental age of 13. Since he failed number 20 the star is lowered to the point between 33 and 54 or a mental age equivalent of 11.

To be sure, the stars thus placed are not intended to give a reliable mental age in each ability represented, but to show the relative excellence of the subject in the different processes. If the line connecting these stars is a horizontal line the individual has no exceptional abilities so far as they are included in these tests. If in some particular column the star is markedly above or below the points in the other columns, exceptional ability or defect in this particular phase of his mental life is indicated.

The superiority of such a profile over a simple total performance score is obvious. If properly used it will serve as a valuable guide to corrective teaching or to proper placement in industry.

There is another advantage in having such a profile from an *omnibus form of test rather than from the old form* where the subject is given a limited time for one type of performance and then changed to another. In the latter method some incidental circumstance in the examination might hinder the subject's performance in one test that would not occur in another. The irregularity in the profile would then be the result of incidental factors in the examination situation rather than the picture of the ability of the subject. In the omnibus form the subject is continually shifting from one type of operation to another and the fact that one type of problem is consistently failed and another correctly solved is evidence of ability rather than of an accidental product of the test situation.

TEMPERAMENT AND MENTALITY IN MATURITY, SEX AND RACE[1]

S. D. PORTEUS

Director of Research, Psychological Laboratory, The Training School at Vineland, N. J.; Professor of Clinical Psychology, University of Hawaii

During the past fifteen years, psychologists have been very busy in devising intelligence tests—tests that is to say, which attempt to measure inborn mental capacity. Up to a certain point their efforts have been comparatively successful so that we now have fairly reliable measures of the all-round capacity of young children; rather less reliable measures of the capacity of individuals in early adolescence; and very unreliable measures of the capacity of adults. As a result of this work certain psychologists have made some surprising statements. The first is that no very significant mental differences are discernible between males and females. The assumption has been made that the differences in achievement of men and women are not due to innate differences in the sexes but merely to inequalities of opportunity and training.

A second, even more surprising discovery is that no significant mental development is discernible in the individual after about fifteen years of age—learning capacity having reached its peak of efficiency by this age. In accordance with this it has been pointed out that the psychologists who carried out the army examinations in the late war found that the average mental age of the enlisted men was only about 13.8 years. The vice-president of the Psychological Section of the American Association for the Advancement of Science, in his retiring address[2] said, "It is a fact then that average scores of intelligence tests do not advance significantly after the age of fourteen years or thereabouts." He appears to consider this conclusion to be in agreement with the facts of growth in general, stating that the organism arrives at approximate maturity of growth in stature and in many other physical traits in early adolescence and that the test scores indicate also the maturing at about the same time of intelligence as measured by mental tests.

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[1] An address given to the Clinical Society of Surgeons at Wistar Institute of Anatomy, Philadelphia, Pennsylvania, November 10, 1923.

A third remarkable discovery is that race, too, is an insignificant factor in mental development. Japanese, Chinese, and American children educated together in American schools reach approximately the same scores in intelligence tests. The assumption has been made that differences in racial achievement are also due, not to innate differences in the races concerned, but to inequalities of opportunity. While it is true that differences in the racial average have been found between children of American stock and those of the southern European races such as the Italian and Portuguese, yet if the Orientals can be brought by better education up to the American level, it does not seem unlikely that the same thing can be done with the southern European peoples. Even the observed differences between the American negro and the white children are attributed by certain anthropologists as being due, in the main, to the environmental disadvantages of the former.

Accordingly we may summarize these remarkable conclusions as follows:

There are no significant mental differences between males and females. There are no significant mental differences between the average fourteen-year old boy and the average man. There are no significant mental differences between the races.

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[2] Guy M. Whipple, The intelligence testing program and its objectors, conscientious and otherwise. Reprinted from School and Society, vol. XVII, no. 440, May 26, 1923; vol. XVII, no. 441, June, 1923. .

Undoubtedly the studies from which these conclusions are drawn may be, as far as they go, careful and reliable, but the conclusions themselves may be at the same time too sweeping and only partially justified.

These conclusions are astonishing for the simple reason that they run counter to everything that commonsense observation tells us of the importance of sex, maturity and race. In this day and age of intellectual freedom and opportunity it seems strange to ascribe the difference in achievement of the two sexes merely to environmental facts. It is equally difficult to believe that the differences in progress made during the last fifty years by the Japanese and Chinese are not due to actual differences in the racial intelligence of the two peoples. It seems much more reasonable to believe that the Japanese and the Chinese and the American people have just about the religion and the government and the scientific and industrial status that they deserve to have. With regard to the statement that there is no significant growth in intelligence after fourteen years[1] and that the "mental age" of the American nation on the average is that of a child of fourteen years, I believe that we should demand the fullest proof before we accept statements such as these that run so contrary to everyday experience. Maybe the psychologist is like the man who went fishing and because he could not catch a fish came home with the firm belief that there were none to catch. The fact that the psychologist has not discovered any of the mental differences associated with sex, maturity and race, does not by any means prove that none exist. My object in this paper is to report some of the results that I have obtained in the search for these differences.

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[1] The weakness of the argument for the early cessation of mental growth is well stated by the late Prof. J. A. Green (Jour. Exper. Ped., December, 1922). "*The fact that mental tests necessarily adapted to a puerile world do not bring out superior intelligence of older people is not a proof that intelligence ceases to grow at fourteen. If our thermometers measure temperature up to only 100°, it would be obviously absurd to say that temperatures did not rise higher.*" There are also some psychologists who have duly emphasized the importance in mental measurements of factors due to sex and race. Cf. Yerkes, Bridges, Hardwick, A point Scale for Measuring Mental Ability, Chapters 6 and 7.

Taking the greatest heresy against commonsense first, there is no significant growth of intelligence from early adolescence to maturity, we may remark that the facts regarding physical maturity do not by any means back up this conclusion, at least in respect to the most important growth of all—brain development.

For the past eight years I have carried on studies on brain capacity as calculated from the three head measurements—the maximum antero-posterior length, maximum breadth and auriculo-bregmatic height. The formula for calculating the capacity was worked out by Dr. Alice Lee in Karl Pearson's laboratory in London. Testing this formula on the heads of subjects in the dissecting room at the Anatomy Department of the University of Melbourne, Dr. Anderson found that it gave the capacity within a 6 per cent average error. In collaboration with Dr. Berry, Professor of Anatomy at the same University, I measured the heads and calculated the brain capacity by Lee's formula of some thousands of individuals of all ages from six years to maturity and have published the figures of brain growth for each year upon which figure 1 is founded.[4] So far from brain growth being complete at fifteen years in the male it will be seen that it continues right on to a period between twenty and thirty years of age. If mental growth ceases at fifteen years of age then this additional brain growth has no connection with the growth of intelligence. This is a most unlikely assumption. In order to show the significance of brain capacity I have marked on the graph the average brain volume of a group of university students representing the educated class; a group of indigent adults representing the comparatively socially inefficient; a group of blind representing those in whom brain growth has been hindered by sense deprivation; a group of Australian aboriginals *representing a race in whom brain growth has remained* at a low level because of the lack of stimulus in their simplified environment; and finally a group of adult feebleminded—all males.

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[4] R. J. A. Berry and S. D. Porteus, Intelligence and social valuation. Research Publication No. 20, Training School, Vineland.

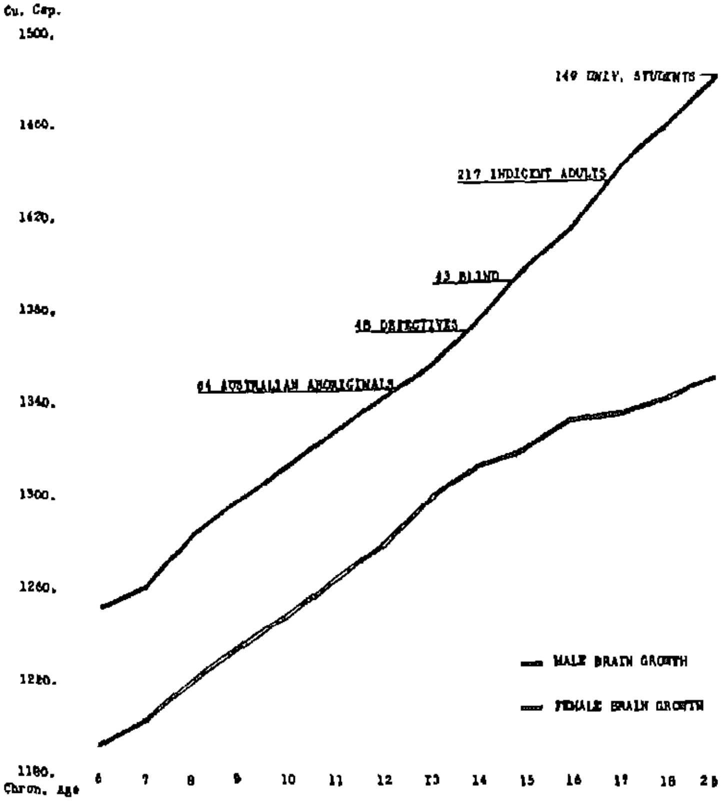

FIG. 1. MALE AND FEMALE BRAIN GROWTH IN ANGLO-SAXONS

The relation of brain capacity to intelligence has been shown in another way. I examined by mental tests a group of 200 cases in the extremes of brain size. The relation to intelligence is obscured because there are both large headed and small headed feebleminded but the fact remains that there are four times as many feebleminded among the small heads as among the large heads and on the other hand five times as many of superior intelligence among the large heads as among the small heads. However, the microcephalic can take comfort in the fact that at least 5 per cent of the very small heads are of superior intelligence while 14 per cent of the very large heads are "block-heads." Summarizing these results we may say that there is a relation between size of head and intelligence as regards the group but not necessarily as regards each individual. However, even as regards the individual, while absolute capacity is of little value as an index of intelligence, yet undoubtedly, brain growth is very closely connected with the individual's growth of intelligence. Where there is early and complete cessation of brain growth as in the microcephalic a condition of feeblemindedness inevitably ensues. In other words it is perhaps the relative amount of post-natal or more probably post-pubescent brain growth that is closely correlated with intelligence in the individual rather than the absolute capacity. The important lesson that the graph conveys is the fact that brain growth does proceed, at least in the educated classes, not only, through the immediate post-pubescent period but through adolescence as well. It is probable that it continues right into the third decade of life. Kaes has stated that the growth of nerve processes goes on into middle life. In other words for the differences in stability and soundness of judgment in youth and maturity there is a physical basis. It may of course be objected that as the graph is founded on the measurements of preparatory college and university students, this post-pubescent brain growth may occur only in the educated classes and not in the average population. However, there is every indication that this is not the case. Measurements of over 4000 cases of average social grade showed that brain growth proceeded parallel to that of better social grade though at a lower level and there was no sign of any diminution of growth at fourteen years where our measurements of this group ceased. The fact that the indigent adults reached as close to the university students as they did, is additional evidence that brain growth does not cease in the lower social grades at fourteen years. The commonsense view point that there are very significant differences in the intelligence of the average individual at fourteen years and twenty-five years has ample support from the facts of brain growth.

This brings us to the next contention that there are no significant differences in mental capacity between the sexes. Here again the facts of brain growth as well as common sense, contradict the theory. The graph also shows the brain growth of males and females. That of the female is less than that of the male at each age from six years onward but roughly parallels male growth up to fifteen years of age—thence it diminishes in rate considerably and virtually ceases at or about the eighteen-year level. It may be true that this lessened brain capacity in females is related in earlier youth merely to differences in body growth in general as reflected, for instance, in stature but this will not explain the very serious diminution of post-pubescent brain growth in the female. I believe that to this superiority of post-pubescent brain growth we can ascribe the greater average general efficiency of males and that herein also lies the fundamental reason why this is and will remain a man-directed and not a woman-governed world—universal suffrage and woman's rights and coeducation notwithstanding.

The reasons why I consider this post-pubertal growth to be of such importance may be seen from figure 2 which indicates the growth of the layers of the cerebral cortex. Adopting Watson's grouping of the nerve cell layers it will be seen that in comparison with such an animal as the mole there is relatively little difference between the animal and human as regards the two lowermost layers—the granular and infragranular. It is the supragranular layer which is the distinctively human development in the cortex. Through the work of Bolton, Mott and Watson it has been shown that it is this layer which is most deficient in the feebleminded and undergoes the first and greatest degeneration in chronic dements. This layer evidently subserves learning capacity which is deficient in the feeble-minded. By a statistical study of the feebleminded[5] I have shown that it is not only in learning capacity that the feebleminded are deficient but in certain temperamental traits as well. They tend to lack planning capacity, they are irresolute or impulsive, easily confused, excitable, obtrusive, suggestible and simple. Many of these temperamental deficiencies may be summed up by saying that they are underinhibited and as this is true also of the demented it is very likely that the integrity and development of the supra-granular layer are essential not only to learning capacity but also to self-control. The diagram also shows that while the other two layers are complete in early childhood it is this most important supra-granular layer that continues to grow. At birth 93 and 82 per cent respectively

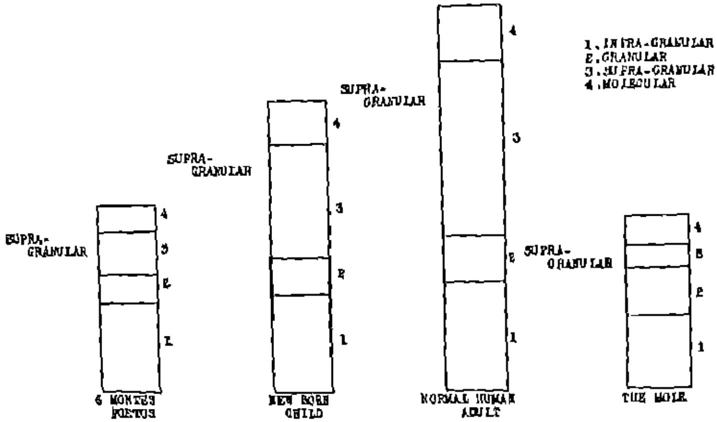

FIG. 2. RELATIVE DEPTH OF CEREBRAL CORTICAL LAYERS

(After G. A. Watson and J. Shaw Bolton)

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[5] S. D. Porteus, Study of the personality of defectives with a social ratings scale. Publication No. 23, Research Dept., Training School, Vineland.

of the two lower layers are complete while the supra-granular layer has only 60 per cent of its adult depth. The assumption is that it is the supra-granular layer which is completing its development after puberty. The greater nervousness, impulsiveness and lessened emotional control in women may possibly be ascribed to lessened supra-granular growth. As regards the efficiency' of the individual the later the growth the more important it is.

Turning now to the problems of race we can also find evidence for a physical basis of observed differences. During my two years tenure of the chair of Clinical Psychology in the University of Hawaii, I have measured some 5000 heads and I am presenting results for the Oriental races in figure 3. It will be seen that the Japanese children at six years are practically on the same mark as the Anglo-Saxon and that they continue to roughly parallel the white race in brain growth up to the point where my measurements ceased—the sixteenth year. There is, however, a slight tendency of the Anglo-Saxon superiority to increase with age. The differences may be in part ascribed to the lessened bodily size and stature of the Japanese but if this is a factor then the inferiority of the Chinese to the Japanese at every age is much more striking because the former are the taller race. I cannot help but believe in the importance of these differences in average brain development and in them, to my mind, lies one of the chief reasons why Japan and not China is a great world power today. The Japanese are racially more intelligent. These results are confirmed by a comparison of the female brain capacity where the three races occupy the same relative positions.

We may now turn to the quest of the mental correlates of these physical differences. It is true as previously stated that in learning capacity there are no significant differences between the male and female, between the early adolescent and the adult, and between one civilized race and another. The American girl learns, if anything better than the boy; the boy learns, if anything, more readily than the adult;

the Chinese more readily than the Japanese. But it is in their adaptation to life's situations that the man excels the woman, the adult the boy, the Japanese the Chinese.

The capacity for all-round adjustment has been made the basis of the most commonly quoted definition of intelligence

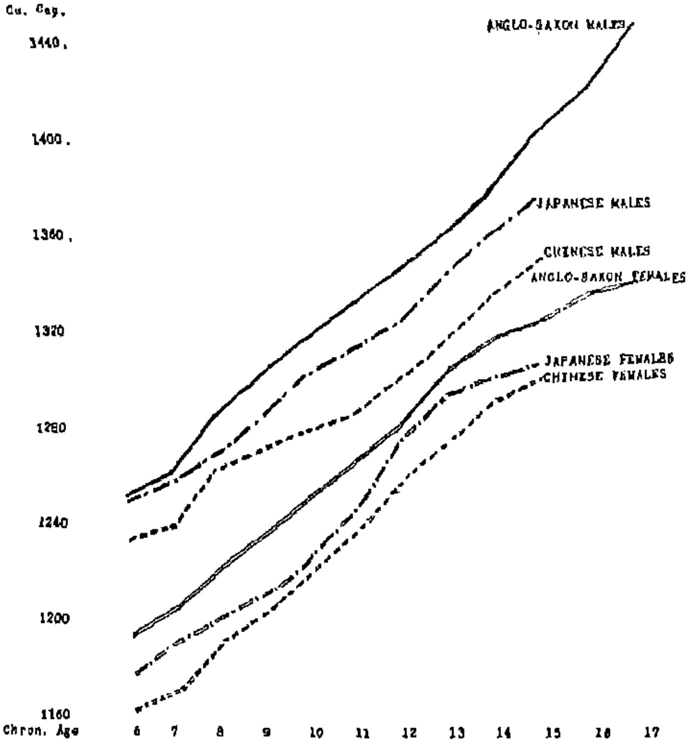

FIG. 3. BRAIN GROWTH IN RACE AND SEX

as being "general adaptability to new situations." I am proposing to substitute for this the simpler but more expressive definition of intelligence as "*progressive adaptability*." The advantages of this definition are that it can be used to define either individual or racial intelligence, whereas to speak of "new" problems for the race is beside the mark. The new problems for the individual are the old, old problems of the race. The modified definition puts the emphasis where it belongs, not on the newness of the problem but on the newness of the adaptation. As regards the history of the race, the development of civilization has consisted and will consist in new adaptations to old problems. A further advantage consists in the fact that the proposed definition properly distinguishes instinctive from truly intelligent action. The bee in making its comb or the bird in building its nest may be exhibiting perfection of adaptation to what is, to the individual bird or bee a new situation. But it is not intelligent action because the ability is not carried over to, or does not function in other situations. In other words, it is not *progressive* adaptability. Finally the original definition makes no reference to the value of the adaptation to the individual. It does not emphasize the purposive nature of intelligent action. The modified definition is sufficiently general to make any reference to the value or purpose of the adaptation unnecessary. By embodying in the definition the idea of growth, we can consider any increase of adaptability an increase of intelligence whether it be in a "vertical" or "lateral" direction.

Keeping this definition in mind we can now compare the races in point of present-day achievement and classify them as regards intelligence. The Chinese for instance have had a great history and have made some notable contributions to civilization. They are credited with the invention of gun powder and of printing but their adaptability has not been progressive. In fact they reached a plateau of development many years ago. While they may have been the first to use printing, their alphabet with its thousands of characters was so cumbersome that the invention was of no value to the common people. Racial progress consists very largely in bringing the works of genius within either reach or comprehension of the common people. The Western mind was able to seize on their inventions, to readapt them and to put them to use. It is not therefore in the field of learning capacity only that we must look for the mental correlates of brain superiority. We must recognize that progressive adaptability is not merely a matter of learning capacity but of the possession of the temperamental qualities of courage, persistence, and determination in the face of difficulties, of ambition and the will to succeed, of foresight and planning capacity and prudence in the execution of plans. Other things being equal as regards mental equipment the individual who possesses these temperamental qualities will succeed far beyond the suggestible, unforeseeing, impulsive, heedless or over-emotional person. The race also which on the average is superior in these characteristics will write its name largely upon the pages of history.

In order to test these important temperamental qualities, I devised a series of tests ten years ago. These consist of a series of printed mazes graded in difficulty through which the individual must trace his way, being penalized in the scoring for every mistake made. Repeated trials are allowed so that it is possible to observe the ability of the person to profit by his errors and to readapt his methods. It is evident that the one who is impulsive, head strong, who leaps before he looks, or who fails to follow a premeditated plan or is nervous, excitable and emotional will tend to become confused and fall into error. Upwards of 1000 children of various races were examined by these and other tests in Hawaii. In learning capacity as measured by the Stanford-Binet test, as was to be expected, there were no very significant differences between the Portuguese, Chinese and Japanese and no very significant sex differences either. None of these groups at any age measured up to the average of 1000 children of Anglo-Saxon origin whom I tested in Australia by the same series of tests and whose performance is indicated in figure 4 by the full black line. The differences, however, may not represent real differences in intelligence but may be due very largely to language disabilities and environmental differences. Japanese children examined in large Californian cities such as San Francisco and Los Angeles were proved by Darsie[6] to have, on the average, equal intelligence scores to white children.

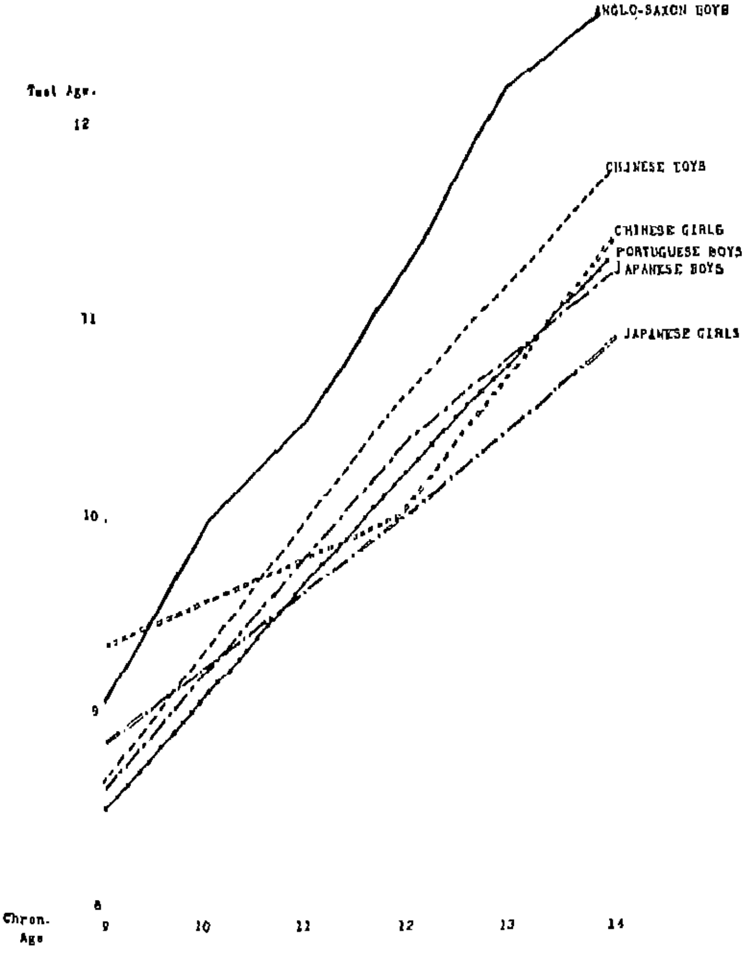

FIG. 4. INTELLIGENCE, SEX AND RACE

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[6] *M. L. Darsie, Preliminary report on the mental capacity of Japanese children in California.*

Leaving aside the comparison of the white children with the children examined in Hawaii, our graph goes to prove that differences in performances of various racial groups under the same environment are insignificant when tests of the Stanford-Binet character are used.

But the tests of this nature are far from telling the whole story with regard to the prediction of the capacity for progressive adaptability in the individual. The value and limitations of these tests, in this respect, have been admirably summarized by Thorndike,[7] who says:

> If the boy has had ordinary American opportunities, his score (in tests of the Stanford-Binet type) will prophesy rather accurately how well he will respond to intellectual demands in the cases of "book-learning" at the time and for some time thereafter, and very possibly for all his life. It will prophesy less accurately how well he will respond in thinking about a machine that he tends, crops that he grows, merchandise that he buys and sells and other concrete realities that he encounters in the laboratory, field, shop and office. It may prophesy still less accurately how well he will succeed in thinking about people and their passions and in responding to these.

Now it is evident that a person's tendency to hasty and ill-considered action, to become easily rattled or confused or conversely, his foresight, prudence and self-control are factors that will affect his responses to the problems of the laboratory, the shop, the field and the office. Still more are they likely to affect his reactions to people and their passions. Success in life is not, of course, wholly due to such temperamental qualities but at least we may say that it is due to mentality plus temperament.

When the tests involving these factors were applied to the various racial groups, comparatively wide differences in performances appeared (fig. 5). Despite the fact that the Japanese boys were below the Chinese in Stanford-Binet level, in the maze they were markedly superior to the Chinese at every age from ten years onwards. Up to the age of ten years they were superior to a group of American children. The Japanese girls, while inferior to the Japanese boys, were

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[7] Intelligence and its measurement: A symposium. Jour. Educat. Psych., March, 1921.

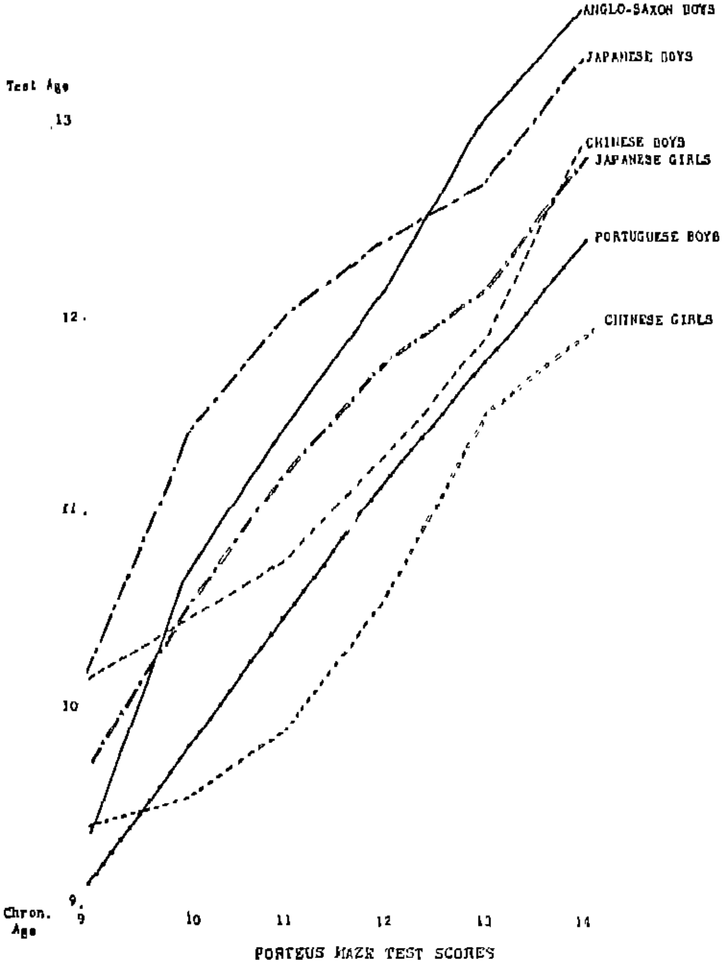

FIG. 5. TEMPERAMENT, SEX AND RACE

ahead of the Chinese girls. Hence we can state that as regards tests of development involving the capacities of persistent effort, resistance to suggestibility, mental alertness and power to inhibit nervousness and emotion, the Japanese are considerably superior to the Chinese and Portuguese, and males of every race are superior to the females. The superiority of the Japanese over the Chinese is all the more marked because of their inferior standing in the tests of learning capacity. As the groups of children examined were the same for each race it could not therefore be objected that the Japanese were a more generally intelligent group.

The tests used stopped at fourteen years but in other work[8] that I have carried out with tests of this nature, I have found that improvement both in speed and accuracy tends to go on in both males and females up to twenty years of age. But the improvement of the males above fifteen years of age is much more marked than in females. In other words the curve of development of prudence and planning capacity is for both sexes of similar form to that of brain growth.

What are the practical results of these racial differences? They show up, to begin with, in higher education. I examined all the entering college freshmen of the University of Hawaii with the Thorndike intelligence test for high school graduates. The Anglo-Saxon group made the best average score, the Japanese came next and the Chinese next. When the scholastic records of the three groups were examined at the end of the year, it was found that the Japanese had taken first place, the Anglo-Saxon group dropped to second and the Chinese remained last. The Portuguese are of such inferior mentality that they are hardly represented in the university at all. It is evident that the Japanese persistence and determination to succeed were standing them in good stead. They are making up for their inferior learning capacity by faithfulness and diligence in study. From the social standpoint the differences show up in the same striking way as is indicated by figure 6. This shows the representation of the various races in the Territorial Prison proportionate to the percentage of each race in the total population. Criminality in the Japanese, according to these figures, is only one-third that of the Chinese and Portuguese. The unfavorable position of the Hawaiians in this respect may be interpreted not so much as disrespect for law as indifference to jail.

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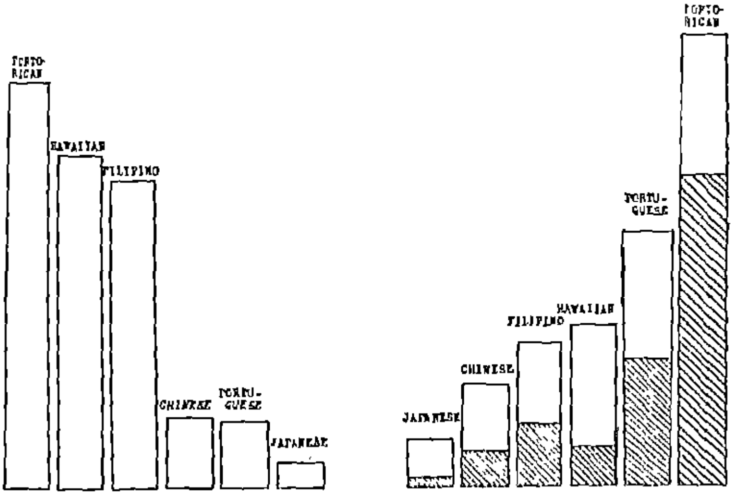
[8] Dorothy M. Bassett and S. D. Porteus, Sex differences in Porteus maze test performance. Publication No. 22, Research Department. Vineland.



RACE AND CRIMINALITY

Jail inmates proportionate to racial population.

RACE AND MENTAL RETARDATION

Cases referred to clinic for examination. Shaded area—proportion of feebleminded.

FIG. 6

The figure also shows, in the same way, the proportionate representation of the races in the cases referred to the psychological clinic as being mentally retarded. There again the Japanese have proportionately to their quota of the population, the most favorable position. The Portuguese show the biggest percentage of mental retardation, which is to be expected since their scores indicated in many cases inferior learning capacity as well as temperamental inadequacy.

From the industrial standpoint, the statistics of bank deposits show a relatively large increase for the Japanese over other nationalities, 30 per cent of the Japanese having savings accounts as against 10 per cent of the Chinese and 9 per cent of Portuguese. From the national standpoint, the temperamental stability of the Japanese is a wonderful asset. Their fortitude and coolness in the recent great disaster have been the admiration of the whole world. Politically speaking, this study also may bear a lesson and that is, that as a competitor with other nations for domination of the Pacific, Japan must by no means be underestimated. Their national cohesion is a thing to be marveled at. While the Chinese have intermarried very largely with native Hawaiian, not 1 per cent of those of mixed race have Japanese blood.

This work of studying racial differences is in its extreme infancy. The tests that we are using are inadequate to explore the whole great field of temperament but I am convinced that it is in this field that some of the most significant individual and racial differences are to be found. The results already obtained[9] require verification by fuller and wider investigations. Other and better tests and examinations for the purposes of racial research need to be developed. Through the coöperation of the University of Hawaii and the Vineland Laboratory, arrangements have been made for parallel studies on racial differences to be carried on in both places. The research program of the latter institution has been extended so as to include the study of the causes underlying racial as well as individual retardation. To this end a laboratory for racial research has been established there under the present writer.

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[9] These results will be fully reported in a forthcoming monograph by S. D. Porteus and M. E. Babcock.

A TEST OF THE DOWNEY WILL-TEMPERAMENT TEST

MELVILLE J. HERSKOVITS

I

The present paper is the result of an attempt to validate the Downey Group Will-Temperament Test before utilizing it in an anthropometric and psychological study of Variability under Racial Crossing upon which the writer is engaged. The original intention was to give this test to such groups of individuals of Negro-White ancestry as might be available together with another test, to see whether there might be any light thrown upon the perplexing question of the existence or non-existence of racial temperamental traits, and, through the results and the genealogical data which are also being gathered, to indicate whether or not there is concomitant variability between such standing and amounts of racial mixture. At the same time it was realized that the practical difficulties of giving the Downey group test in research such as this were not small: it is not simple to gather groups of adults who will consent to be tested, and even more difficult to induce such groups to gather where the necessary physical appurtenances to the Downey test, such as blackboard, adequate places to write, and the like, might be available. It was decided, therefore, to determine through a preliminary study of the test, whether it would show results which would justify its use in the major problem on which the writer is engaged, or not, before so utilizing it.

At the suggestion of Prof. E. L. Thorndike,[1] the following plan of procedure was determined upon: The writer gathered three groups of his personal acquaintances, and the group form of the Downey test was given to each group. The first, numbering 8 individuals, was tested October 31, 1923; only 7 of the tests were utilized, however, for reasons that will be explained below. The second group, of 8 persons, was tested November 12, the third, of 10, November 25. This gave a total population of 25.[2] The groups were so arranged that each person in the group would know every other person well, and, in many instances, intimately. This was the case in every group but the first, and it was because the eighth person in this group was a comparatively recent acquaintance of all except one of the other members of the group, that his score and the ratings of his traits were not utilized. The tests were given where there was adequate blackboard space and writing facilities, and timed with a laboratory stop-watch. After the test had been given, in each case, every person present was given card-index cards numbering as many as there were persons present who had taken the test. On one of these, he was told to write "self," and on each of the others the name of one other person in the group. The self-ratings, however have not been utilized in this study. The cards were next arranged by each individual in the order in which he felt he knew those present (although this was not done in the case of group I) and the writer, who gave all the tests, then announced that each person was to rate every other person on the twelve traits which the Downey test is supposed to test. After the tests had been given and the ratings made, but before the former were scored or the latter tabulated, the writer also rated the individuals in groups I and II.

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[1] The writer wishes to express his appreciation to Professor Thorndike for his generous advice in the statistical treatment of the data, and to Miss Margaret Mead for assistance in giving the test to group I, and for arranging for the meeting of group III.

It is realized that the definitions of the traits, as given by Dr. Downey, are difficult to grasp, but it was felt that it would not be proper to go behind them, and it was attempted to give an equal opportunity for each rater to grasp the meaning of the names of the traits only by reading those definitions which are given in the *Manual for the Individual Test.*[3] The writer, therefore, would read these definitions as many times as was desired, and until all present seemed to understand them quite clearly, or, at least, ceased asking for re-readings, but no interpretations were attempted. However, since at least two of the groups were composed of persons psychologically sophisticated, it is felt that the handicap of the definitions is perhaps not as great as might be imagined, although it is not denied that they are very elusive. Before the rating was attempted, each person was told that he was to rate everyone else present on a scale of from 0 to 10. This was done so that the scores in the test might be compared directly with the ratings. After the data were all in, they were treated statistically as will be shown below. Before entering on a statistical exposition, however, it may be well to give a sketch of the groups and their composition, for they represent three distinct types as to occupation, and, at least in one case, perhaps, as to temperamental qualities. It will be remembered that Dr. Downey, in discussing an earlier attempt to evaluate this test, states that "One cannot help wishing that Ruch had gone somewhat into case-studies, which would undoubtedly have illuminated his findings."[4] Space will be taken, therefore, to give the age, sex, years of schooling, relationship, if any, to other members of the group, occupation and other information about each person who took the test as may be pertinent to the discussion in hand. The three groups will be spoken of as groups I, II, and III, respectively, and the individuals by number under their respective groups: thus, individual I 3 would be the third individual in the first group, III 3, the third in the third group. The numbers will be used consistently throughout this paper.

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[2] The smallness of the groups is in accordance with Dr. Downey's recommendation that the number given the group test at any one time be kept low so as to obviate disadvantages of position, hearing, and the like. Downey, The Will-Temperament and its Testing, p. 69.

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[3] June E. Downey, Downey Individual Will-Temperament Tests. Manual of Directions, 1922, p. 19 ff.

[4] Op. cit., p. 177. A similar statement is made by Dr. Downey in her article, Testing the Will-Temperament Tests, School and Society, vol. xvi (1922), pp. 161-168.

Group I, composed of 8 persons, contained all but 2 who were musicians or artists. Four of the 8 constitute members of one family, and might therefore be expected to know each other exceptionally well. Of the remaining 4, 1 has been closely known to this family for over five years, a second for over three, a third, for almost a year, while the last, whose score and the estimates of whose traits were discarded, has only known and been known to the rest of the group for a few weeks. I 1 is a young woman, twenty-two years of age. She is a pianist by profession, and has had a secondary school education, supplemented by work at Columbia University as a special student. She is the daughter of I 4 and I 6, the sister of I 3, and studies piano with I 5. I 2 is also a pianist by profession, and has had a secondary education and some college work. She is nineteen years of age, and is particularly well known to I 1, I 3, and I 4, who were the only ones rating her. I 3 is the son of I 4 and I 6, is eighteen years of age, and a second-year student at Columbia College. His mother, I 4 is a violinist of repute in musical circles, forty-two years of age, with a secondary school education followed by extensive musical training. She was perhaps better known to all the members of the group than any other person in it, and, in turn, knew all others perhaps best. I 5 is a pianist, a man twenty-nine years of age, a well-known concert artist, accompanist, and composer. He completed a college course, and is continuing his studies in the field of science, being also an able mathematician. He is a person of very positive traits, and it is interesting to notice (see table 1) that the averages of the estimates of his traits ran unusually high, the lowest being 7. He has been well known to the members of the family in this group for over three years, and, as has been said, is the person with whom I 1 studies at present. I 6 is a lawyer, forty-seven years of age, the husband of I 4 and the father of I 1 and I 3. I 7 is a singer, thirty-six years of age, with a public school education. He, too, has very definite temperamental traits, and was judged by 5 of the other persons present. I 8 is an illustrator, but, since he was not well known

TABLE 1

Scores and averages of estimates of persons tested

INDIVIDUAL		TRAIT											
		A	B	C	D	E	F	G	H	I	J	K	L
I 1	Test score........	7	5	7	6	5	5	1	8	5	3	2	3
	Average rating....	$7\frac{2}{5}$	$5\frac{1}{5}$	$5\frac{1}{5}$	$3\frac{4}{5}$	$6\frac{2}{5}$	$4\frac{3}{5}$	$4\frac{3}{5}$	$3\frac{3}{5}$	$4\frac{2}{5}$	$7\frac{2}{5}$	$5\frac{1}{5}$	$5\frac{1}{5}$
I 2	Test score........	3	10	3	2	4	7	1	2	1	10	8	0
	Average rating....	$6\frac{1}{3}$	$5\frac{3}{4}$	$4\frac{1}{4}$	$8\frac{1}{4}$	6	$0\frac{3}{4}$	$6\frac{1}{3}$	$6\frac{2}{3}$	$4\frac{2}{5}$	$4\frac{1}{2}$	$4\frac{1}{2}$	2
I 3	Test score........	4	9	5	9	3	5	5	2	8	9	1	4
	Average rating....	$6\frac{1}{3}$	$0\frac{3}{4}$	$4\frac{1}{3}$	$5\frac{1}{2}$	$5\frac{2}{3}$	$5\frac{1}{2}$	$4\frac{1}{3}$	$4\frac{1}{4}$	$5\frac{1}{2}$	$8\frac{1}{2}$	$6\frac{2}{3}$	$7\frac{1}{6}$
I 4	Test score........	8	10	5	4	3	3	10	6	6	10	1	1
	Average rating....	$5\frac{1}{3}$	$5\frac{1}{3}$	$6\frac{1}{6}$	$0\frac{1}{5}$	8	$5\frac{1}{4}$	$6\frac{2}{5}$	4	6	$5\frac{1}{2}$	$4\frac{1}{4}$	$7\frac{1}{5}$
I 5	Test score........	0	7	8	3	6	9	7	2	9	10	10	7
	Average rating....	9	$8\frac{1}{3}$	7	$8\frac{2}{5}$	$7\frac{1}{2}$	8	$8\frac{1}{5}$	$7\frac{3}{4}$	$8\frac{3}{5}$	$8\frac{3}{8}$	$7\frac{1}{3}$	$8\frac{3}{4}$
I 6	Test score........	8	9	6	6	2	2	1	8	4	10	0	10
	Average rating....	$0\frac{1}{2}$	$6\frac{3}{4}$	$0\frac{1}{4}$	8	$0\frac{3}{4}$	$9\frac{1}{4}$	$8\frac{1}{4}$	9	$6\frac{1}{2}$	$7\frac{1}{2}$	$8\frac{1}{2}$	$5\frac{1}{4}$
I 7	Test score........	4	0	0	8	8	1	2	2	1	7	1	7
	Average rating....	$0\frac{1}{3}$	8	$5\frac{3}{4}$	$7\frac{5}{6}$	$6\frac{1}{4}$	$0\frac{5}{6}$	$6\frac{1}{4}$	$6\frac{1}{3}$	7	$7\frac{1}{4}$	$0\frac{1}{3}$	$0\frac{5}{6}$
II 1	Test score........	10	6	4	10	5	6	3	9	5	8	5	10
	Average rating....	6	$5\frac{3}{7}$	$5\frac{1}{4}$	$0\frac{1}{7}$	$6\frac{1}{8}$	$8\frac{5}{8}$	$7\frac{5}{7}$	$7\frac{1}{7}$	$0\frac{6}{7}$	$6\frac{5}{7}$	$5\frac{1}{8}$	$5\frac{4}{7}$
II 2	Test score........	4	5	6	5	5	7	2	3	4	8	9	2
	Average rating....	$7\frac{1}{7}$	$0\frac{4}{7}$	5	$6\frac{5}{7}$	$6\frac{1}{7}$	8	$0\frac{3}{7}$	$8\frac{5}{8}$	$7\frac{5}{7}$	$7\frac{1}{8}$	$7\frac{5}{7}$	$7\frac{4}{7}$
II 3	Test score........	1	1	4	5	6	2	6	10	9	4	1	5
	Average rating....	$5\frac{3}{8}$	$7\frac{1}{2}$	$6\frac{3}{8}$	$5\frac{3}{8}$	$0\frac{1}{2}$	$7\frac{1}{2}$	$7\frac{7}{8}$	8	$8\frac{3}{4}$	$6\frac{3}{8}$	$6\frac{3}{8}$	$8\frac{3}{4}$
II 4	Test score........	5	10	6	10	4	2	5	2	3	10	3	3
	Average rating....	$6\frac{1}{7}$	$6\frac{3}{7}$	$4\frac{4}{7}$	$5\frac{1}{7}$	$6\frac{1}{7}$	5	$5\frac{5}{7}$	7	$6\frac{6}{7}$	$8\frac{1}{2}$	7	$8\frac{1}{3}$
II 5	Test score........	6	8	6	0	5	1	9	5	3	8	6	3
	Average rating....	$6\frac{1}{8}$	6	$6\frac{1}{2}$	$5\frac{5}{7}$	0	$6\frac{1}{8}$	$5\frac{6}{7}$	$5\frac{1}{3}$	6	$6\frac{1}{8}$	7	$5\frac{3}{8}$
II 6	Test score........	4	0	7	10	5	7	4	2	1	8	6	0
	Average rating....	$6\frac{1}{2}$	$6\frac{1}{4}$	$6\frac{1}{8}$	$0\frac{1}{8}$	$7\frac{1}{8}$	$7\frac{1}{8}$	$0\frac{3}{8}$	$0\frac{1}{4}$	$7\frac{1}{8}$	$6\frac{1}{4}$	$5\frac{3}{4}$	$0\frac{1}{4}$

TABLE I—*Continued*

INDIVIDUAL		TRAIT A	B	C	D	E	F	G	H	I	J	K	L
II 7	Test score........	3	10	2	10	4	8	10	4	0	7	2	5
	Average rating....	7¾	7½	0⅞	0½	8⅛	0¼	7	5⅜	5⅜	7⅜	6⅜	7¼
II 8	Test score........	10	9	6	7	0	1	5	0	4	9	0	2
	Average rating....	8⅛	8¼	5⅛	7⅛	6⅜	7½	7⅝	7¼	7⅛	5⅞	0⅜	7¾
III 1	Test score........	10	10	2	8	9	5	8	10	10	8	10	2
	Average rating....	8⅚	9⅙	6⅚	8⅚	6⅚	9⅓	9	9⅓	7⅙	8⅓	8⅞	8⅝
III 2	Test score........	8	9	9	6	5	3	4	4	3	10	7	7
	Average rating....	6⅚	4⅓	7	5¾	7¼	5⅚	6⅜	5⅜	4	4¾	6⅞	5⅞
III 3	Test score........	6	5	6	—	4	2	0	—	2	7	3	7
	Average rating....	3⅚	0	4⅔	—	3⅚	4⅚	4⅔	4⅔	5⅞	5⅙	4⅔	7
III 4	Test score........	7	6	8	5	5	4	4	10	2	10	7	6
	Average rating....	7⅘	6⅙	5⅙	7⅑	7⅙	7⅓	7⅙	7⅚	5⅙	5⅙	5⅙	6
III 5	Test score........	10	9	3	4	5	3	1	4	0	7	10	1
	Average rating....	5⅚	3	6⅓	5⅚	5⅗	4⅚	3⅙	4⅚	5⅓	3⅚	4⅙	3⅚
III 6	Test score........	10	8	8	5	7	3	0	0	9	10	8	1
	Average rating....	6⅓	6⅚	5⅔	5⅔	5⅗	·7⅓	0⅚	7	7⅙	6⅚	6⅓	7⅝
III 7	Test score........	7	6	7	5	8	6	1	0	0	10	10	8
	Average rating....	8⅔	3⅔	6⅚	5⅝	8⅙	6⅙	5	5	5⅙	5⅜	0⅙	6⅞
III 8	Test score........	10	0	0	3	3	2	2	10	3	5	1	8
	Average rating....	6⅓	6⅙	7⅚	6⅓	6⅘	7⅚	7⅚	7⅚	5⅙	4⅚	0⅞	7
III 9	Test score........	10	8	4	4	3	1	3	10	8	10	8	1
	Average rating....	5⅝	4⅓	4⅓	5	4⅝	7⅔	6⅞	7⅓	5⅚	6⅞	5⅙	4
III 10	Test score........	10	9	8	4	4	2	6	10	9	10	6	1.
	Average rating....	5⅙	5⅞	4⅞	6⅔	5⅘	0⅓	5⅞	6⅜	4⅝	6⅞	5⅔	4⅞

to the others, his score and the estimates of him were not utilized. However, he is an intimate friend of I 7, and therefore his rating of the traits of I 7 were used. His estimates of other persons present were not used. The estimates which I 2 and I 7 made of the others present, were, for the most part, not utilized, because both of these were evidently either unused to rating persons on a scale or impatient in doing so, most of the scores being either 5, 8, or 10, with an occasional 0. The writer himself later rated all the persons in this group, the independent judgments thus numbering from 4 to 6 for each trait of each person.

Group II consists of persons who are either professionally engaged or in business, and is much more homogeneous from the point of view of the age of its members than is group I. The persons in it have been associating together socially for at least five years, and many of them longer; in addition, 2 of the members are husband and wife, while another is the brother of the husband. The group is closely knit, and the members have spent much time together, and are eminently fit to judge each other as this test of the Downey test requires. II 1 is a business man, twenty-five years of age, who attended college three and one-half years. II 2 is an engineer, who holds the degrees of B.A. and M.E., and is twenty-four years of age. II 3 is a broker, twenty-two years of age, who has had two years of advanced educational training, though he has never worked for a degree. He is the brother of II 6, and the brother-in-law of II 7. II 4, a woman twenty-seven years old, holds the degree of B.A., and is a private secretary at present in charge of a large relief organization. II 5, a woman of twenty-five, is a social worker and was rated "best known" by the three other persons in the group. She is a college graduate. II 6, the husband of II 7 and the brother of II 3, is a salesman, who has had three years of college training. He is twenty-four years old. II 7, twenty-two years of age, describes herself as "housekeeper-student," and was for some years a bacteriologist. II 8 is also twenty-two years of age, holds the degree of B.A., and is a psychiatric social worker. As might be expected in a group where all the members know each other so well, only in 1 case did each fail to rate all the others. All but one was also rated by the writer, thus giving

8 independent judgments in practically every trait of every test taken.

Group III is homogeneous from every point of view. The age range is from nineteen to twenty-three; all the members are students or graduates within the past year of the same college, 2 holding the degree of B.A., 1 being a second-year student, the others third- or fourth-year students. Finally, all the 10 members of the group lived together for a year in an apartment which is being used as a dormitory by the college which they all attend or attended, and hence know each other exceptionally well. Further, they are all given to considering each other's traits, and are highly competent to participate in such a test as this. Several members, not now undergraduates, may be mentioned: III 1 is at present taking graduate work in psychology and anthropology. She is a person of very definite temperamental traits, and is unusually well known to all the members, as is witnessed by the fact that she is rated lower than "second best known" by only 2 out of the 9 judging her. III 2 is a journalist, and was the room-mate of III 7, a poet, each of whom rated the other "best known." The writer did not rate the members of this group, so there are 9 judgments for each trait of each person, except in a few cases in which 1 individual did not rate 1 person on 2 traits, and another on 7. III 3 arrived as test III was being given, which means that no scores might be given on traits D and H. Therefore, in the correlation of the standing in the traits and the averages of the ratings N equals 298 instead of 300. In the other groups, occasionally an individual would rate another on less than the total number of traits, and this is the reason that the total number of ratings, 2152, is not as great as it would be had everyone rated everyone else on every trait. It was felt, however, that it was not desirable to insist on complete ratings, but that a sacrifice of numbers in the interest of the greatest possible accuracy in rating was most to be desired.

II

The Downey Will-Temperament Group Test, it will be remembered, is a battery of 12 tests based mainly on handwriting valuation. It may be well to give a list here of the traits which are tested; it would be highly desirable to also give the definitions of those traits given by Dr. Downey, but space forbids, and they may be consulted in the place already referred to. The traits are:

A. Speed of movement, VI-1
B. Freedom from load, VI-1-2
C. Flexibility, VIII
D. Speed of decision, I
E. Motor impulsion, X
F. Self-confidence, XI
G. Non-compliance, XII
H. Finality of judgment, XIII
I. Motor inhibition, VII
J. Interest in detail, IX
K. Coördination of impulses, V
L. Volitional perseveration, VIII-2

The first correlation which was computed was that between the score of a given person in a trait and the estimates made by each of his acquaintances of his standing in that trait. That is, every score was tabulated once for every estimate of it, and the result, computed from a total of 2152 independent judgments, by the Pearson product-moment formula, gave

$$r = 0.06$$

The probable error of the coefficient, computed by the formula $\text{P.E.}_r = \frac{0.6745(1 - r^2)}{\sqrt{N}}$, is

$$\text{P.E.}_r = \pm 0.012$$

At the same time, it was felt that the low result which obtained from this correlation might be due to several statistical faults, among which might be the correlation of heterogeneous data, or the undue weighting given the scores as against the individual ratings. It was therefore determined to average the ratings of each individual on each trait. This seemed advisable for several reasons, not the least of which is the fact that, as has been amply demonstrated, the reliability of the averaged ratings of a trait in a person comes much nearer being a criterion of the extent to which that person has that trait than single judgments.[5] This was accordingly done and the result, by the Pearson product-moment formula, gave

$$r = 0.13$$

while the probable error, by the formula given above, gave

$$\text{P.E.}_r = \pm 0.038$$

It was felt, however, that a further closer statistical analysis of the data was to be desired before any conclusions might be drawn as to the usability of the test, and therefore correlations were computed for each of the 12 tests comprising the battery, the correlation being score in test times average of the estimates, as it was felt that for the reasons above given the averages would be the most reliable to be used, while the individual ratings would not give a sufficient number of cases if correlations were computed from them for each test, to be of any significance. For this series of correlations, the Spearman Method of Rank-Differences was used, the formula being $\rho = \frac{6 \Sigma D^2}{N (N^2 - 1)}$. The results are shown in table 2. The correspondence of the mean, 0.12 ±0.03, is strikingly close to Meier's[6] average of the pooled correlations of test scores with estimates of three sets of judges, his being 0.1183 ± 0.08.

It is to be noted that Dr. Downey stresses the value of her test as diagnostic of the "mental set" of a person,[7] and lays great stress on the profile rather than on the quantitative standing in her tests. At the same time, it cannot be denied that, valuable as a profile-method of determining character may ultimately be, it cannot be utilized so long as there are no established norms with which to compare a given profile, in a definite case. And these norms cannot be developed other than statistically, and since statistical procedure is essentially a matter of dealing with quantitative data, it is well-nigh impossible that the psychographic means of presentation can be considered here, or other than scores be utilized. It will be remembered, however, that Dr. Downey in her discussion of the profile divides temperaments as shown by the tests into three types, those in which the traits A to D predominate, giving the type showing "speed and fluidity of reactions," those in which traits E to H come out strongly, the type of "forcefulness and decisiveness of reaction," and those in which traits I to K are pronounced, the type exhibiting "carefulness and persistence of reaction."[8] If the table

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[5] H. L. Hollingworth, Judging Human Character, p. 69. Harold O. Rugg, Is the rating of human character possible? Jour. Educat. Psychol. vol. 12 (1921), p. 425 and ff.

[6] Norman C. Meier, A study of the Downey Test by the method of estimates, Jour. Educat. Psychol., vol. xiv (1923), p. 380.

[7] Op. cit., p. 73.

TABLE 2

Correlation between scores in tests and averages of estimates of traits

TRAIT	ρ	N
A. Speed of movement	−0.03	25
B. Freedom from load	0.18	25
C. Flexibility	0.12	25
D. Speed of decision	−0.05	24
E. Motor impulsion	0.21	25
F. Self-confidence	0.10	25
G. Non-compliance	0.18	25
H. Finality of judgment	0.35	24
I. Motor Inhibition	0.29	25
J. Interest in detail	−0.001	25
K. Coördination of impulses	0.28	25
L. Volitional perseveration	−0.14	25

Mean = 0.12 ± 0.03
Median = 0.15 ± 0.04
σ = 0.15 ± 0.03

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[8] Op. cit., p. 62.

of correlation of the individual traits be noticed, it will be seen that there is no pronounced homogeneity in any one of these sets of traits. In the first four, the correlations vary from −0.05, to 0.18; in the second, from 0.10 to 0.35; in the third, from −0.14 to 0.29. It would seem that the second grouping is the most significant, but the reliability of coefficients as low as these is to be highly doubted. Ruch and Del Manzo[9] found a similar range of variation in the correlations of trait-scores and estimates, the lowest being −0.04 (trait G) and the highest 0.53 (trait K). There is little correspondence between their findings, and those of the present study, however, a rank-correlation of the two giving $\rho = -0.14$.

It was felt, however, that there were still many discrepancies in the statistical procedure and method of approach to the problem which might be criticized,—the lack of understanding of the definitions of the traits when read, the smallness of the number of persons tested, and the like. Therefore, it was determined to correct the correlations for such attenuation as might be involved in chance errors arising from the giving of the tests or the rating process. A method has been provided by Spearman[10] whereby correction of this factor of chance error may be made. It is, to quote Kelley,[11] who presents several variations of it, "a promise of the correlation that one might expect to find if one had perfectly reliable measures." In other words, it is the correlation beyond which it is not possible to go, but between which and the coefficient calculated any future coefficient computed from comparable data might be expected to lie. The form used here is the modification suggested by Thorndike,[12]

$$\sqrt{\bar{}}_{xy} = \frac{\sqrt{(r_{x_1y_1})\ (r_{x_2y_2})}}{\sqrt{(r_{x_1x_2})\ (r_{y_1y_2})}}$$

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[9] The Downey Will-Temperament Test, a further analysis of its reliability and validity, Jour. Appl. Psychol., vol. vii (1923), p. 74.

[10] Amer. Jour. Psychol., vol. xv (1904), pp. 72–101; ibid., vol. xviii (1907), pp. 161–169; British Jour. Psychol., vol. iii (1910), pp. 271–295.

[11] Statistical Method, p. 208.

[12] Mental and Social Measurements, p. 179.

To use this formula, there needs to be intercorrelation between two independent series of the same data, represented by $r_{x_1x_2}$ and $r_{y_1y_2}$, and the correlations between the first and second series, and the second and first, respectively, represented by $r_{x_1y_2}$ and $r_{x_2y_1}$. In the present use of the formula, the following procedure has been used:

Let $r_{x_1y_2} = 0.124$, the mean of the correlations of the Downey scores of individual traits times the averages of the estimates of those scores,

$r_{x_2y_1} = 0.127$, the product-moment correlation of the Downey scores times the averages of the estimates of those scores,

$r_{x_1x_2} = 1.00$, an assumed perfect correlation between scores from trials of the Downey group test, a coefficient more favorable than might be expected, or than has been shown, and let

$r_{y_1y_2}$ = an intercorrelation between sets of ratings. Let this correlation vary, and let r_{xy} be computed when it is assumed to be 0.10, 0.30, 0.60, and 0.90, respectively.

Then, when $r_{y_1y_2} = 0.10$, $r_{xy} = 0.30$
$= 0.30$, $r_{xy} = 0.23$
$= 0.60$, $r_{xy} = 0.16$
$= 0.90$, $r_{xy} = 0.13$

It must be remarked again that these coefficients are corrected for attenuation, and are what might be expected if all the chance errors due to defects in the measures were eliminated, and that they must therefore be higher than they are to let us postulate reliability in the test when judged, at least, by the criteria of the opinions of raters who are familiar with the subjects tested and competent to rate them.

III

In view of the tests of the Downey group test which have been carried on in the manner described above, and the results which statistical analysis of the findings gives us, it is felt that great caution should be exercised in the use of this test. While it is freely admitted that ratings by individuals of their acquaintances may vary tremendously, and that single opinions may be dismissed as worthless, it must be remembered that the low correlations shown above result from the average of no less than 4, and in many cases as high as 9, opinions given by raters who were selected for the reason that they knew the persons that they rated exceptionally well. The higher the number of opinions averaged, the more reliable the average becomes for purposes such as this. Certain defects in the present treatment must be taken into consideration, of course: thus, in the tabulation of tables of the ratings, it was found that there was a distinct tendency in at least one group to lean toward the upper range, possibly from the invidious nature of the associations with the lower numbers of the scale "0 to 10." Again, as has been mentioned, the small number of persons tested might well influence the result, or the qualitative element involved in scoring certain of the tests may contribute toward error. On the other hand, the lowness of the correlation when corrected for attenuation is impressive, and certainly points toward the need for further very careful research into this test before it can be used. Certain of the individual traits show trends that may indicate that stress should be laid on them in future attempts to devise tests of character and temperament, while the possibility always present that the tests are really testing something other than defined by Dr. Downey must not be forgotten. Certainly such tests, if tenable norms can be established, may show results which will be of value in the study of problems such as the one on which the writer is at present engaged, but the Downey group test still needs a great deal further revision if it is to be of use along these or other lines. What changes need to be effected it is not in the province of the writer to state. It is certain, however, that until such researches have been made and established, the greatest caution must be utilized in drawing conclusions from this test

THE IMMEDIATE HEREDITY OF PRIMARY AMENTS COMMITTED TO A PUBLIC INSTITUTION

A STUDY OF THE PARENTS OF FORTY-FIVE INSTITUTIONAL CASES

V. MOORREES[1]

I. OBJECT OF STUDY AND METHOD OF COLLECTING DATA

The prime object of this study is to try to discover what type of mentality is represented by the parents of children who are inmates of an institution for the feebleminded, and what relation, if any, exists between the mental ages of these primary aments and those of their parents. In the treatment and consideration of the data collected, other issues will quite naturally arise. The relation of their intelligence quotients to the occupations and wage earning capacities of one or both parents, the relation between the mental ages of wives and husbands, facts gathered from the clinical histories are all of importance and will be dealt with according to their intrinsic values.

The material for the study was collected on Randall's Island, where is situated the New York City Children's Hospital, an institution which accommodates approximately 1250 patients. Since the results of the investigation were to be treated statistically, it was of the utmost importance that the selection of cases should be, as far as possible, a random one, the more so in view of the fact that the institution is in its nature selective, certain classes of people sending their children there, while others more fortunately situated make provision for them in private institutions or in their own homes.

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[1] In collaboration with L. E. Poull, Ph.D., Psychologist, New York City Children's Hospital, Randall's Island.

From the day on which the study was taken up, the selection of cases was made both from the new admissions and from those already admitted, the names of the former being taken from the register, working backward in strict order.

In selecting the children for this study the following were regarded as being unsuitable to figure in it:

1. Clear cases of secondary amentia.
2. Epileptics or such cases as showed a history of convulsions.

This selection was not based on the belief that the epilepsy and feeblemindedness are necessary concomitants or that they stand to one another in the relation of cause and effect, but the performances of epileptics are so erratic as to invalidate any statistical application. As regards convulsions, it is very difficult from the meager details and inaccurate descriptions furnished by parents, to decide whether the convulsions are epileptic seizures or ordinary infantile convulsions due to teething, etc.

3. Abandoned children, whose parents could not be reached and children who had lost either or both of their parents.

Parents were interviewed and arrangements made for them to come to be tested. This opportunity was further utilized for getting additional information as to the family history and generally for checking the records already filed in the office of the institution. Most of the parents were willing to coöperate, especially when told that they were assisting in the study of the cases of their children. A few had to be urged more strongly, and in 2 cases only, where a discharge had already been secured, was the request met by a refusal.

The tests used were as occasion demanded, the Kuhlmann-Binet, the Pintner-Patterson Performance, but a glance at table 1 will show that these cases were comparatively rare, and that the scale most extensively used was the Performance. Whether this scale adequately represents the persons tested and what its relation to the Binet is, will be discussed later on.

In accordance with Terman's findings and the accepted clinical practice, the I.Q's, of the parents were worked out on the basis of *fifteen* years.

Certain tests of the Performance Scale were omitted to avoid the preponderance of a type of test which it was felt really measured the same function. These tests were the Triangle, the Two-Figure, the Four-Figure and the Five-Figure.

(Throughout the study, the term Binet refers to the Stanford Revision of the Binet-Simon tests.)

II. REVIEW OF PREVIOUS STUDIES

The close resemblance between parents, grandparents, and children, with reference to both physical and mental traits, has been a matter of common observation for a considerable period and several studies have been undertaken to establish these resemblances and give them a quantitative value.

These studies are so widely known and have been so often quoted that they do not demand more than a bare reference to their results. They fall roughly under two heads:

1. Biometrical studies, which attempt to estimate statistically the correspondence between parents and offspring with reference to certain physical traits.
2. Psychological studies which attempt to do the same with reference to mental traits.

To the first class belong the studies of Pearson and Galton who worked on the quantitative correspondence between parents and offspring with reference to certain physical features. Pearson in *Nature and Nurture* found the average correlation to be somewhere near 0.5. This type of study can only be valid if the things measured are properly classified and enumerated.

More interesting perhaps are the studies that fall under the second head. Among the first of these is Galton's study of 977 eminent men, this number representing a selection from among 4000 persons. These 977 men had 535 relatives of the same degree of eminence. His general conclusions are that men of ability rise above their environment, especially if many opportunities are given them; further that men cannot achieve great eminence unless they have extraordinary natural abilities. Cattell's study of scientfic men in the United States generally confirms these conclusions.

Woods made a study of hereditary mental and moral traits in royalty. The persons figuring in this study were rated on a scale ranging from 1, which denoted lack of mental and moral stability or capacity, to 10, which was the mark given to persons who were exceptionally gifted in morality or intellect. That the hereditary factor figures strongly in the possession of these traits, is shown by the fact that the greatest distribution of exceptional persons fell into 4 of 15 royal families.

He also arrived at the conclusion that the right of succession had no effect on ability. On the whole he attributed 90 per cent of the possession of the traits to heredity. This was hardly justified since his correlation between father and offspring was 0.30 and the persons were rated according to subjective estimate.

Starch found that the average correlation between brothers and sisters, when measured for such capacities as reading, spelling, writing, etc., was 0.42. The correlations in the group ranged from 0.05 to 0.72. In the tests for memory, cancelling A's, etc., he found an average of 0.38, ranging from 0.07 to 0.65. On ranks in all tests combined the coefficient was 0.73. There are similar studies by Dexter and Earle and an interesting research by Schuster and Elderton. Thorndike's correlations between the performances of twins rank very high, the lowest being 0.69 and the highest 0.90.

Two studies, which have a closer relation to this research, in that they are concerned with the inheritance of mental deficiency, are those of Goddard and Tredgold. Of the 327 cases that form the basis of Goddard's study, 54 per cent showed "other feebleminded persons in such numbers or in such relation to the individual cases as to leave no doubt of the hereditary character of the mental defect." Under the heading of "probably hereditary" the percentage is 11.3. The remaining cases are divided among "neuropathic ancestry, accident," and cases for which no sufficient cause could be shown. The number of unclassified cases is 27. Tredgold found that 64.5 per cent of his cases showed hereditary conditions of amentia, insanity or epilepsy, though how large a percentage is to be attributed to amentia alone is not evident from his study. Beyond the fact that he employed the usual clinical procedure in obtaining a case history, there is no other evidence from Tredgold's Manual as to how he arrived at the facts concerning mental deficiency in the ancestry of his patients. The methods used by Goddard's field workers are clearly described in his text.

We see at once that neither of them used instruments of precision for gauging the mental capacity of parents or other ancestors, though naturally many factors would have operated to make such a procedure impossible to the latter case. Two facts are evident:

1. That however well trained a field worker may be, or however shrewd the source of indirect evidence, there is always the possibility of error.

2. If it had been possible for them to use standardized tests it is more than likely that a higher percentage of mental deficiency in the ancestry of the cases investigated would have been found. As they stand at present the cases presenting well defined features would have been noted, but the more subtle distinctions could not be accurately gauged by subjective estimate. The clinical history in England, where a comparatively negligible language difficulty exists, is likely to be more precise than it is here in America.

In many of the cases reviewed for this study, the deponents did not know whether their parents were alive or dead, or in the latter case what the causes of death were. Similar information as to collaterals furnished the same difficulty. The descriptions of diseases in infancy were often inaccurate, especially, as has been pointed out before, with reference to convulsions. The tendency to exaggerate the health and normality of the family on the whole was evident. It is reasonable to suppose then that even with the maximum of care, errors may creep into the data. Even after the most rigorous sifting, 5 of the 50 cases on which it was first intended this study should be based, had to be abandoned.

However, the researches of Goddard and Tredgold place mental deficiency in the ancestors in a very close and obvious relation with the same condition in the offspring, or descendants. This relation is further proved by the investigation of such families as the Jukes, Nams and Kallikaks. The figures quoted by other authorities come strikingly near the estimate of Goddard; Wilmarth gives 66 per cent and Rogers 65 per cent. The whole mass of evidence seems to point to the fact that heredity plays a strong part as far as the inheritance of mental, moral, and intellectual traits is concerned. It would be unreasonable to assume that the hereditary factor is operative in the case of physical resemblances and not in the case of the other factors listed above.

On the other hand to minimize the influence of environment in so far as it offers facilities for development would be crude and unscientific and one could not do better than quote Giddings in his introduction to Dugdale's study of the Juke family:

> No scientific man would say that we know enough about human heredity to justify the social reformer in basing any very radical, practical program of social reform upon biological conclusions. We can only say that probably heredity is a fateful factor in the moral, and therefore the social realm, but that we need an immense amount of patient research to determine exactly what it is and what it does.

III. PRESENTATION OF THE DATA

The results of the studies summarized in the preceding section point to the conclusion that mental traits are hereditary, though to what degree and along what lines is, at present, not clearly established.

However varied the interpretation of feeblemindedness may be, from the clinical standpoint a person who is mentally deficient is one, who, when no other adequate reason can be found, cannot in certain tests reach the standards that have by careful experimentation been determined for normal persons. It is from this point of view that the following data are presented and from this point of view that they should be interpreted. Table 1 shows the data collected in as compact a form as possible.

It will be noticed at once that only 9 of the children show I.O's based on the Performance Test, whereas all of them have had a Binet or a Kulhmann-Binet. The reason for this is that the children were either too young or too low in mentality to handle the material for the Performance Test. On the other hand, owing to language disability, only 20 of the parents have had a Binet, whereas all of them have had a Performance Test. These facts, will, however, not invalidate a correlation between the two groups, if we use only Binets or Kuhlmann-Binets in the one case and only Performance in the other.

Three successive columns give the average score of the parents, and the scores of those who made a higher or a lower score. The last two columns are meant to give an abbreviated clinical sketch of each case, the most important facts having been selected and presented. In the columns where the children's Wassermanns are tabulated "N" means a negative reaction to the test; "D." doubtful: "B.N.O." that the blood was not obtained, and a blank, that there was no return in that case. Table 2 shows the central tendencies and variabilities of such facts as are of interest.

Interpretation of table 2

Q1 is the point on the scale below which lie 25 per cent of the cases and above which lie 75 per cent. Similarly Q3 is the point below which lie 75 per cent and above which lie 25 per cent of the cases. The median is the point on each side of which lie 50 per cent of the cases.

Thus in the column of children's scores, 25 per cent of the children fall below 19.3; 25 per cent between 19.3 and 29.4; 25 per cent between 29.4 and 49.4; and 25 per cent above 49.4. Thus also 50 per cent lie below and 50 per cent above 29.4, and 50 per cent lie between 19.3 and 49.4.

Q is derived from the formula

$$\frac{Q3 - Q1}{2}$$

TABLE I*

PATIENT	I.Q. BINET (STANFORD)	I.Q. BINET (KUHLMAN)	I.Q. PERFORMANCE	WASSERMANN	AGE IN YEARS	FATHER (A)					MOTHER (B)					AVERAGE I.Q. OF PARENTS	I.Q. OF PARENT MAKING LOWER SCORE	I.Q. OF PARENT MAKING HIGHER SCORE	INFANTILE DISEASES OR DISEASES IN INFANCY	REMARKS
						I.Q. Binet	I.Q. performance	Age	Weekly wage	Occupation	I.Q. Binet	I.Q. performance	Age	Weekly wage	Occupation					
1		24		N.	5		73	46	$35	Varnisher		53	30	$		63	53	73		Pituitary microcephalic.
2		51			5	88	92	27	14-20	Laborer	87	65	27			79	65	92	Measles, rectal operation	Maternal grandmother died at 38 of cancer
3		10		N.	9		90		45	Cutter	82	53	43			62	53	70	Measles	Second cousin feeble minded
4	43		43		17	85	66	54	35	Paper-cutter	91	73	50		Factory hand	69	66	73	Chicken-pox, whooping cough, measles, scarlet fever, chorea	Father's Wassermann positive
5	70		72	N.	10		67	33	30	Window-washer		51	30			59	51	67	Chicken-pox, measles, whooping cough, tonsilectomy	
6		23		N.	10	86	60	48	40	Baker	85	53	45		Factory hand	57	53	60	No illnesses	Father was alcoholic
7	39			N.	12		60	48	20	Farm-hand		60	42			60	60	60	Measles, whooping cough, mumps, pneumonia, chorea	

8		23		D.	8		74	43	35	Agent wholesale grocer		47	35			61	47	74	No illnesses	Instrumental delivery, microcephalic
9		25		B.N.O.	2		97	30	32	Tailor	120	80	27			89	80	97	No illnesses	
10	56		58	N.	15	94	87	49	25	Hoisting Eng.	87	30	41			69	50	67	Measles, whooping cough	
11	45		48	N.	16		60	55	25–30	Iceman and peddler		40	46			50	40	60	Measles	
12		64		N.	4	81	53	55	25	Tailor	87	63	41			56	53	63	Measles, chicken pox, tonsilectomy	Instrumental delivery
13		12		N.	11		40	47	75	Fruit-peddler		47	40			44	40	47	Diphtheria, pneumonia, measles	Mongoloid type
14	73			N.	6		60	40	28	Tinsmith		40	40			50	40	60	Measles, anterior poliomyelitis	
15		17		N.	7		47	50	35	Presser	98	77	38			62	47	77	Pneumonia, diphtheria, otitis media	
16		51		N.	7		77	37	25–30	Shoe-maker		53	33		Servant	65	53	77	Tuberculosis of bowels, influenza	
17		22		D.	7		86		24	Mechanic		53	37		Sales clerk	70	53	86	Whooping cough	
18		22		B.N.O.	5	89	93	34	25	Parquet floor worker	69	66	28			79	66	93	No illnesses	Maternal grand aunt insane, maternal uncle insane
19		5		D.	7		50		35	Time-keeper		45				48	45	50	Diphtheria, asthma	Microcephalic
20		20		N.			80	30	28	Tailor		67	26			74	67	80	No illnesses	Microcephalic
21		37		B.N.O.	3	92	93	42	30	Gramophone repairer	58	63	42			78	63	93	No illnesses	Typical mongolian

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* I. Q.'s on the Performance Scale were raised in accordance with the statistical findings reported in Section 3.

TABLE 1—*Continued*

PATIENT	I.Q. BINET (STANFORD)	I.Q. BINET (KUHLMAN)	I.Q. PERFORMANCE	WASSERMANN	AGE IN YEARS	FATHER (A)					MOTHER (B)					AVERAGE I.Q. OF PARENTS	I.Q. OF PARENT MAKING LOWER SCORE	I.Q. OF PARENT MAKING HIGHER SCORE	INFANTILE DISEASES OR DISEASES IN INFANCY	REMARKS
						I.Q. Binet	I.Q. performance	Age	Weekly wage	Occupation	I.Q. Binet	I.Q. performance	Age	Weekly wage	Occupation					
22		39		B.N.O.	4		73	32	$40	Carpenter		73	28	$	Factory hand	73	73	73	Pneumonia measles	Paternal grandmother died of cancer at 46, macroglossia mongolian
23		29		N.	4		64	37	15	Butcher		73	38			69	64	73	No illnesses	Mongolian features, partial paralysis of tongue
24	42		42	N.	11		72	48	25	Garage		33	38			53	33	72	Measles, right hemiplegia	Paternal grandmother died of carcinoma uterii age unknown
25	63		50	N.	17		60	51	20	R. R. ganger		40	53			50	40	60	Whopping cough	1 brother and 1 sister subnormal
26	36			N.	13		70	32	38	Driver		50	32			60	50	70	Pneumonia, measles	
27	62		58	N.	10		48	34	40	Painter		80	34			64	48	80	No illnesses	Father's Wassermann positive
28		19		N.	11		73	33	20	Barber		47	30			60	47	73	No illnesses	Microcephalic
29	36			N.	14		87	42	30	Metal worker		73	38			80	73	87	No illnesses	Di-plegic

30	68			N.	6		50	33	13	Peddler		56	31		Factory hand	53	50	56	Pneumonia, scarlet fever, whooping cough	Maternal grandfather died at 50 epileptic
31	75		75	N.	10		50	38	46	Tailor	51	50	38	8	Janitress for rent	50	50	50	Scarlet fever, measles	
32		40		N.	7		74	45	55	Excavator		53	37			64	53	74	Measles, pneumonia, tonsilectomy	Maternal grandfather died at 63 of heart disease
33		19		N.	16		50	40	50	Butcher speculator		44	41			47	44	50	No illnesses	
34		26	35	N.	12		73	44	30	Porter		53	38			63	73	53	Measles, pneumonia	
35		24		N.	6		53	33	20	Baker		60	28			57	53	60	No illnesses	Microcephalic
36		9		N.	12		73	34	35	Salesman		40	32		Factory hand	57	40	73	No illnesses	
37		17		N.	15		81	45	40	Carpenter		43	38			62	43	81	No illnesses	
38		22		N.	8		42	65	20	Laborer		53	50	5	Factory hand	48	42	53	No illnesses	
39		46		N.	6		75	29	27	Laborer		40	24			58	40	75	No illnesses	Paraplegic
40		17		B.N.O.	4		73	49	40	Painter		50	40			62	50	73	No illnesses	Cyanosis at birth
41		11			17		80		35	Salesman		57	35			69	57	80	No illnesses	
42		11		N.	8		93	42	45	Salesman		60	37		Milliner	77	60	93	No illnesses	
43		9		N.	1		63	50	20	Longshoreman		50	40			57	50	63	Pneumonia whooping cough	Paternal uncle and 1 cousin hydrocephalic
44		67		N.	4	95	94	56	35	Male nurse	81	67	36		Housekeeper	81	67	94	Pneumonia, whooping cough	
45		27		N.	7		93	31	28	Book agent		66	31			80	66	93	Measles, whooping cough	1 paternal uncle probably feebleminded

The P.E. of the median is the measure of the unreliability of the ascertained median. It is derived from the formula

$$\frac{5}{4} \times \frac{Q}{\sqrt{N}}$$

The chances are even that the true median lies between the ascertained median ±1 P.E. There are 4.5 chances to 1 that the true median lies between the ascertained median ±2 P.E. There are 21 chances to 1 that the true median lies between the ascertained median ±3 P.E. Thus in the distribution for children there are nearly 21 chances to 1 that the true median lies between 29.4 − 8.7 and 29.4 + 8.7.

TABLE 2

Children—Binet and Kuhlmann-Binet

*Q*1	19.3
Median	29.4
*Q*3	49.4
Q	15.5
P.E. of median	2.9

Fathers and mothers—Performance

	FATHERS	MOTHERS	FATHERS AND MOTHERS
*Q*1	60.9	49.1	51.6
Median	71.6	53.7	62.9
*Q*3	82.9	65.8	73.5
Q	11.0	8.49	11.0
P.E. of median	2.1	1.6	1.4

There is a general feeling among workers in psychological clinics that the performance scale does not adequately represent the mentality of adults and that feeling was very strong throughout this study. Moreover for the purposes of a comparative diagram, such as that presented it is necessary that both parents and children be placed on the same, or equivalent, scales. The most frequent correlations reported between the Binet and the Performance, are somewhere near

0.7 and on these it is evident that the Binet and the Performance are not parallel tests. It may also be seen from the tabulations that the ratings on the Binet Scale yield a higher average than those derived from the Performance, and the problem here is how to condition the Performance scores so that they may more or less represent scores on the Binet Scale.

We have 20 cases where the parents did both the Binet and the Performance, but we also see that of those who did a Performance Test alone, only 11 made scores of 80 or more. The remainder therefore made scores that fall in the borderline or subnormal groups. The writer was fortunate in being able, through the kind offices of Dr. Poull, to get the records of 57 subnormals, all adults over thirty years of age, drawn from the island population, who had had both Binet and Performance tests. If then we add these 57 subnormals to 19 of our parents, for it is advisable to exclude the mother of case 9, we shall have a group more or less representative of the parent group.[2]

We have then a group made up of 76 persons from whose median mental ages in months, the following set of data is derived:

	PERFORMANCE	BINET
*Q*1	72.6	86.0
Median	91.25	100.83
*Q*3	113.75	132.25
Q	20.6	23.25
P.E. of median	2.05	1.9

The difference between the two medians is 9.58 months, or roughly 9 months.

The correlation between the Binet scores and the differences between the Binet and the Performance scores is −0.46.

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[2] The advisability of the above mentioned exclusion is based on two grounds: (1) That the individual in question is neurotic and unstable and at the time of the test was under great stress; and (2) she is younger than the average of the parents.

TABLE 3

CASE NUMBER	FATHER	MOTHER
1	78	58
2	88x	87x
3	75	82x
4	85x	91x
5	72	56
6	86x	85x
7	65	65
8	79	52
9	102	120x
10	94x	67x
11	65	45
12	81x	87x
13	45	52
14	65	45
15	52	98x
16	82	58
17	91	58
18	89x	69x
19	55	50
20	85	72
21	92x	86x
22	78	78
23	69	78
24	77	38
25	65	45
26	75	65
27	53	85
28	78	52
29	92	78
30	55	61
31	55	51x
32	79	58
33	55	49
34	78	58
35	58	65
36	78	45
37	86	48
38	47	58
39	80	45
40	78	55
41	85	62
42	98	65
43	70	55
44	95x	81x
45	98	71

(Those scores marked "x" are scores actually made by the parents.)

From this we may conclude that the error would not be very great if we did not raise the performance scores proportionately to their size. *It is proposed, therefore, to add to the scores* of the parents who did not have a Binet, nine months, or its equivalent in I.Q. based on fifteen years, i.e., 5.

The estimated and actual Binet scores of the parents will then be as shown in table 3.

When we take the scores made by the 19 parents in both Performance and Binet we have a small distribution from which the following data are derived:

	BINET	PERFORMANCE
Range	50.0-95	50.90
*Q*1	82.9	54.75
Median	87.0	66.88
*Q*3	90.42	86.25
Q	3.75	15.75
P.E. of median	1.1	4.5

Comparing these facts with those given in table 2 we see that we are dealing with the brighter members of the group of parents, and it would not be right to treat the Performance scores of the remaining parents according to the data derived from this group.

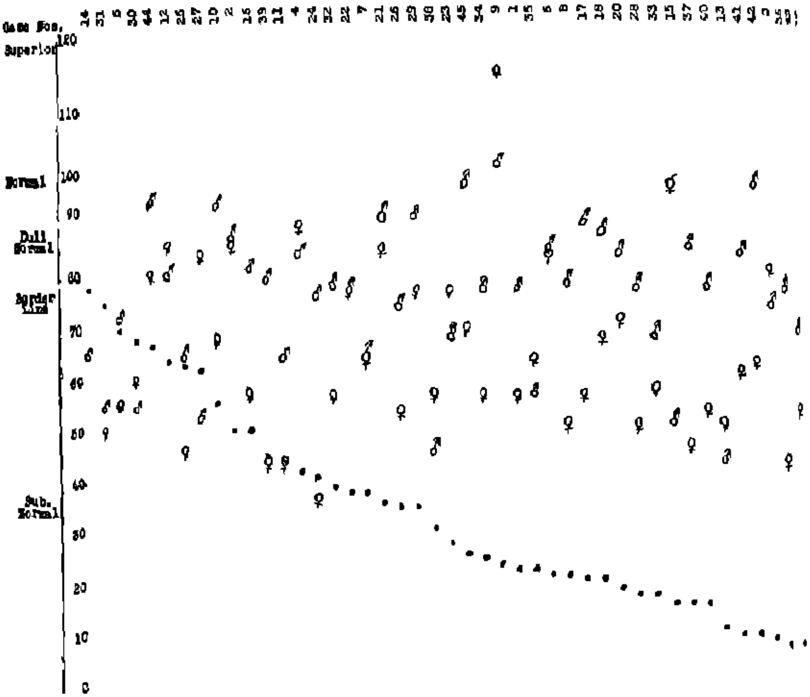
Figures 2, 3 and 4 show the distributions for these corrected scores and the statistical data derived from them are as follows:

	FATHER	MOTHER	FATHER AND MOTHER
*Q*1	67.3	54.3	57.2
Median	78	61.3	72.5
*Q*3	87.7	70.6	85.6
Q	10.2	12.7	14.2
P.E. of median	1.0	2.4	2.0
	AVERAGE	LOWER	HIGHER
*Q*1	60.3	51	70.6
Median	68.8	58	79.3
*Q*3	79.8	70.8	80.2
Q	9.8	9.9	9.3
P.E. of median	1.8	1.8	1.7

These are the data from which the diagram is compiled. Whereas the first set of data enabled us to study the cases individually, we are now able to study them as a whole.

DIAGRAM

Showing the relation of the I.Q. of the parents to that of the children.



The diagram shows the father (♂), mother (♀) and child (●) rated by the same scale, standing in their relative position. Frequent reference will be made to the diagram in developing the points that rise out of the data. It is proposed to discuss the data under the following three heads:

1. The relation between parents and children.
2. The fathers as a social group.
3. The mothers as a social group.

Children and parents

The relation between the social standing of parents and the mentality of their children, has been the subject of many researches. Terman (*Measurement of Intelligence*) found that the average I.Q. of children from a superior environment was 107, while that of children from an inferior environment was 93.

Bridges and Coler (Psych., Review, 1917) using the Poin Scale, showed that whereas the average mental age of children, whose parents could be rated as professional men was seven years ten months, with a corresponding coefficient of mental ability, of 112, the mental age of children whose fathers ranked as unskilled laborers was seven years one month with a corresponding coefficient of mental ability of 83. During the course of the study they tested five mothers of the latter class, who were found to have an average mental age of eight years. Occupations ranking between these extremes showed a corresponding increase or decrease in the average mental ages of the children.

Kornhauser found the approximate correlation between the social status of the parents, as indicated by their having a telephone or not, and the school achievement of the children to be 0.61.

Pressey and Ralston found that 85 per cent of the children of professional men made scores above the median of the group of which they formed a part; for the children of executives and independent tradesmen the percentage was 68; for the artisan class 41 and the laboring class 39 (Jour. App. Psych., 1919). In the same number of the same journal is mentioned a study by Pressey and Thomas, which shows that the children in a good farming district average above children in the poor district.

Such studies as these may be regarded from two points of view; they may be looked upon as emphasizing the influence of environment on the mentality of the children, or the environment itself may be regarded as the outcome of the mentality of the parents, which is transmitted to the next generation. On the basis of these studies therefore, it was to be anticipated that the parents of this study would be a group occupying an inferior position in the social scale; but how they compare with other groups occupying the same status will be shown later on.

The children in this study form an interesting group especially with reference to their relation to their parents, as shown in the diagram. Their relative positions as charted there would hardly lead one to expect a high correlation between children and parents. The diagram shows the parents to be arrayed in a horizontal line, while the children form a diagonal with a drift quite away from the line of the parents. Worked out according to the Spearman method of rank differences they are as follows:

	ρ	r	P.E.
1. Between children and parents on the Performance Scale			
Children and fathers.....	−0.047(−0.05)	−0.05	0.105
Children and mothers....	0.00 (0.1)	0.10	0.105
Children and average.....	0.007(0.01)	0.05	0.105
Children and lower.......	0.032(0.03)	0.03	0.106
Children and higher......	−0.037(−0.04)	−0.04	0.106
Fathers and incomes.....	0.140(0.14)	0.15	0.105
2. Between children and parents, on Binet, actual or estimated			
Children and fathers.....	−0.029(−0.03)	−0.03	0.106
Children and mothers....	0.102(0.1)	0.10	0.105
Children and average....	0.025(0.03)	0.03	0.106
Children and lower.......	0.166(0.2)	0.18	0.102
Children and higher......	−0.046(−0.05)	0.05	0.105
Fathers and incomes.....	0.135(0.14)	0.15	0.102

To explain these correlations, it would be as well to summarize the facts with reference to both children and parents.

1. The Island population is drawn from various sources. Some are court and conduct cases; some come from the un-

graded classes of the schools, while the large majority are voluntary commitments by the parents. Since numbers of feebleminded children never come within the scope of the jurisdiction of the State, we know that the children of the study do not represent the whole population of feebleminded children, though they represent this population to a greater extent than they represent the whole population of all children.

2. There have been unavoidable selective influences as explained in section I.

3. With reference to the parents, the selective influence of the institution has given us a sample of a class of parents who through poverty, lack of feeling, or incompetence cannot provide for their children without the help of the State.

To come into line with biometrical studies, it would be necessary to have a number of cases that cover the whole range.

The correlations as here obtained must be explained by the fact that we are dealing with a segment of the whole table which lowers the correlation, as shown by Boas (Jour. Amer. Statis. Assoc., June, 1921.)

Since we have only the record of one child of the family, we cannot prove whether the law of filial regression would hold in these cases, nor whether children tend to vary around the mean of their parents. It is probable, however, that in many of these cases we have the lowest child of the family, and that the siblings will range from positions above the parents (not impossible as shown by the few cases in the diagram) down to the child here represented. It is probable that the average of the children will, for this reason, come into closer relation with the line of the parents, but whether the correlation will be any higher cannot be affirmed on this speculative basis.

We are, however, faced with the fact that parents of this type do have a child very much lower in mentality than they themselves are. The study certainly tends to show that the population of institutions for the feebleminded is drawn more from the borderline and moron elements of the population than from the grossly subnormal elements.

We have no data with reference to children from private institutions, but even if such parents were found to be of higher mentality than the parents who figure in this study it would still remain to be proved that they are not the carriers of an hereditary taint.

Another interesting fact shown by the diagram is that with one exception there are no parents in the very low grades. Does this tend to show that persons low in the grade for subnormality do not mate; or that they have no offspring; or if they have, that such offspring is not subnormal; or that they do not bring their subnormal offspring to institutions for the feebleminded; or that the children die because the parents have not sufficient intelligence to take proper care of them? It is surely to be expected that if parents of the type that figures in the study, bring a child to an institution, those of lower mentality driven by economic stress would do the same. There are numerous instances of both parents and offspring being inmates of institutions for the feebleminded, and this fact coupled with the possibility that low grade potential parents have already been drafted into institutions, would account for the absence of parents in the lowest grades.

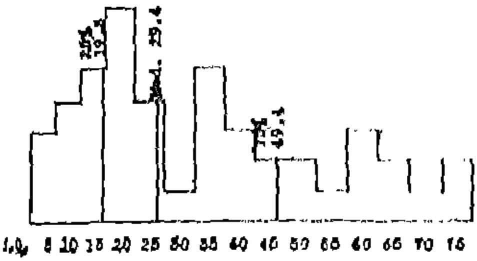
Fathers and occupations

The occupations of the fathers show a fair variety, though it will be noticed that with a few exceptions, there are not many occupations where initiative or the ability to take responsibility is required. Most of them are tradesmen or factory hands; there are a few laborers and a few who described themselves as commission agents, though they are really jobbers.

The correlations between incomes and intelligence is 0.14. This may be due to several factors:

1. Restricted range.
2. The fact that such a correlation except on the broadest lines does not exist.
3. The high wages paid to unskilled labor in this country.

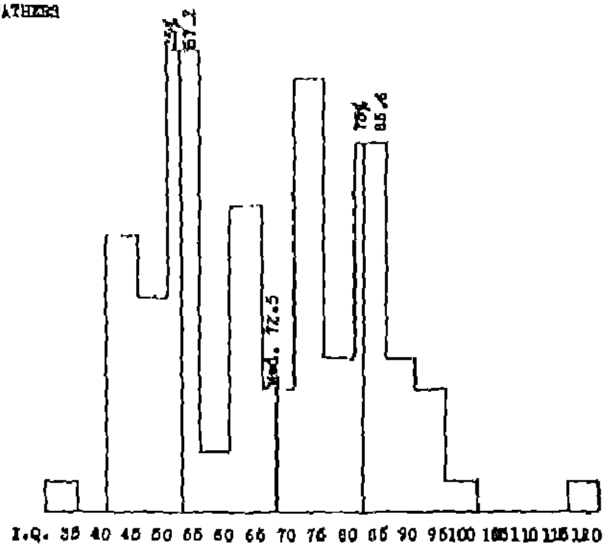
CHILDREN



P.E. of Median = 2.9
Q = 15.6

FIG. 1.

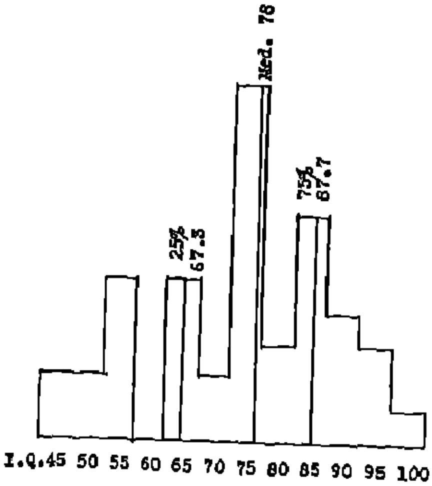
MOTHERS and FATHERS



P.E. of Median = 2.4
Q = 14.2

FIG. 2

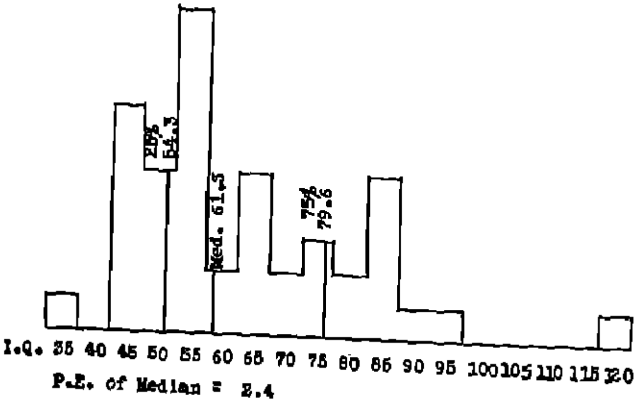
FATHERS



P.E. of Median = 1.9
Q = 10.2

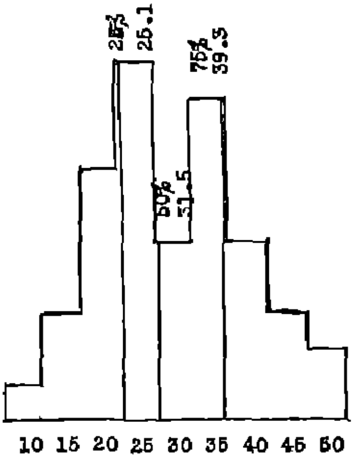
FIG. 3

MOTHERS



P.E. of Median = 2.4
Q = 12.7

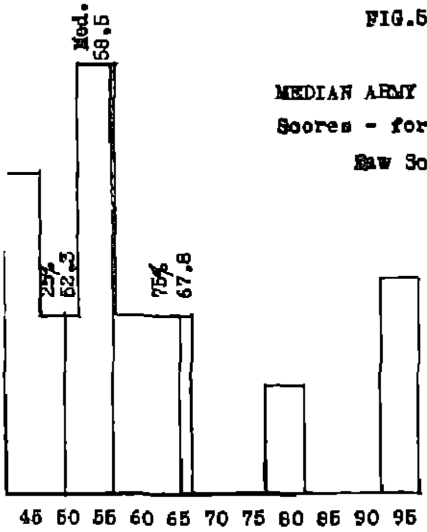
FIG. 4



FATHERS INCOMES
(Weekly wage in dollars)

P.E. of Median = 1.3
= 7.1

FIG.5



MEDIAN ARMY ALPHA
Scores - for Occupations of Fathers
Raw Scores

P.E. of Median = 1.5
Q = 7.8

FIG.6

4. The possibility that parents anticipating a further call on their purses from the institution, wilfully misrepresented their earning capacity.

(This does not, of course, apply to the cases where the incomes have been checked by the social worker; but in the majority of the cases here presented the information was derived directly from the parents.)

Figure 5 shows the distributions of the incomes of the fathers. We have here a group of fathers, whose intelligence measured by a standardized test is below the normal. A mere statement to this effect may have a significance which is purely academical. It would be much more useful if we had some way of comparing these parents as a social and economic group, with another group whose standing in these respects has already been ascertained. The problem would be met if we had some occupational group corresponding to the parent group with which to make the comparison. The results of psychological testing in the army give us the opportunity to form such a comparison for among them we have the data for a group, of similar occupations, where the occupations have been brought into relation with their intelligence ratings. A comparison with this group will enable us to form some idea as to where the parents in this study stand with regard to intelligence in relation to their occupational status. Most of the cases studied here fall in the C, D, and D− groups. The comparison can however be pushed by comparing these fathers individually to their own occupational groups as represented in the Army.

To do this the fathers may be given the median rating made by men of similar occupations in the Army Alpha test. Scores in the Alpha can be transposed into Stanford-Binet scores, and as we have our parents rated according to Stanford-Binet, we shall be in a position to compare the actual ratings as arrived at in this study to what should have been the rating made by the fathers if they possessed the median intelligence of other men following the same occupations. Where the occupation of a parent is not listed in the Army returns, we may rate his more or less by comparison. Thus a tinsmith, plumber and

TABLE 4

CASE NUMBER	OCCUPATION	MEDIAN ARMY ALPHA RATING	STANFORD-BINET MENTAL AGE	I.Q.	I.Q. BY TABLE 3	POSITION BY ARMY QUARTILES
1	Varnisher	58.7	13.5	90	78	1
2	Laborer	46.7	13	86	88	2
3	Cutter	62.8	14	93	75	1
4	Paper-cutter	62.8	14	93	85	2
5	Window-washer	46.7	13	86	72	1
6	Baker	58.7	13.5	90	86	2
7	Farmhand	48.3	13	86	65	1
8	Grocer's agent	95.8	16	106	70	1
9	*Tailor*	53.3	13.5	90	102	4
10	Foreman	80.4	15	100	94	2
11	Peddler	56.3	13.5	90	65	1
12	*Tailor*	53.3	13.5	90	81	2
13	Peddler	56.3	13.5	90	45	1
14	Tinsmith	66.3	14	93	65	1
15	*Presser*	62.8	14	93	52	1
16	Shoemaker	56.3	13.5	90	82	1
17	Mechanic	68.5	14.5	96	91	2
18	Carpenter	59.8	13.5	90	89	2
19	Time keeper	80.4	15	100	55	1
20	Tailor	53.3	13.5	90	85	2
21	Mechanic	68.5	14.5	96	92	2
22	Carpenter	59.8	13.5	90	78	1
23	Auto mechanic	66.4	14	93	60	1
24	Butcher	61.4	14	93	77	1
25	Railroad ganger	46.7	13	86	65	1
26	Teamster	46.7	13	86	75	1
27	Painter	58.7	13.5	93	53	1
28	Barber	54.6	13.5	90	78	1
29	*Sheet-metal worker*	66.2	14	93	92	2
30	Peddler	56.3	13.5	90	55	1
31	Tailor	53.3	13.5	90	55	1
32	*Foreman*	80.4	15	100	79	1
33	Butcher	61.4	14	93	55	1
34	Porter	46.7	13	86	78	2
35	Baker	58.7	13.5	90	58	1
36	Salesman	95.8	16	106	78	1
37	Carpenter	59.8	13.5	90	86	2
38	Laborer	46.7	13	86	47	1
39	Laborer	46.7	13	86	80	2
40	Painter	58.7	13.5	90	78	1
41	Salesman	95.8	16	106	85	1
42	Salesman	95.8	16	106	98	2
43	Longshoreman	46.7	13	86	70	1
44	Male nurse	95.8	13.5	90	95	2
45	Book agent	95.8	13.5	90	98	2
Averages		63.4	14	93	73.5	

sheet metal worker might be rated the same, while a commission agent might be compared to a general clerk.

Table 4 shows the occupations of the fathers with the Median Army rating in the Alpha for that or an analogous occupation. It also shows the median rating transposed into Stanford-Binet mental ages, the corresponding I.Q. and the actual or estimated I.Q. as arrived at earlier in the study (table 3). The last column shows the standing of the fathers with reference to the quartiles of the Army groups.

The following occupations were estimated:

OCCUPATION	RATED AS
Varnisher	Painter
Cutter Paper cutter Presser	General Machinist
Salesman Book agent Male nurse	General Clerk
Window washer Ganger Porter	Laborer
Time keeper Foreman	Concrete construction foreman
Tinsmith Sheet metal worker	Plumber
Peddler	Shoemaker

Figure 6 shows the distribution of the Median Army Alpha scores for the occupations of the fathers. A comparison of the third and fourth columns of table 4 shows that with very few exceptions the fathers individually fall below the median rating for their professions, as determined by the Army groups. The average difference in I.Q. is nearly 20. The last column of the tabulation shows which quartile of the group these fathers would have fallen into by virture of the I.Q.

The raw scores as distributed in figure 6, range from 45 to 100 with a corresponding range in I.Q. of 83 to 110. On the other hand the I.Q.'s of the fathers according to figure 3 range from 45 to 105. This comparison is further borne out when we put the essential data for the distributions side by side.

	FIGURE 6	CORRESPONDING I.Q.	FIGURE 3
*Q*1	52.3	86	67.3
Median	58.5	90	78.0
*Q*3	67.8	93	87.7

Taking *Q*1 as marking off the lowest 25 per cent, we see that 75 per cent of the fathers just come up to the score that would have marked off the lowest 25 per cent of them if they had been on a par with the Army groups.

Figure 6 would tend to show that some of the fathers have been rated somewhat too highly, but there is enough evidence to show that the parent group is low in intelligence when compared to groups pursuing similar occupations. Of the mothers 11 pursued or are pursuing some industrial occupation the findings here being so small as to need no further mention.

The mothers

When we come to consider the case of the mothers in this study, we find a very interesting set of facts. While they have a slightly wider range than the fathers, their median is 61.3 while that for the fathers is 78. It is possible that this indicates a sex difference with reference to the Performance test, though such a difference is not commented on by the authorities who standardized the test.

When the reliability of the differences between the two medians is worked out by formula

$$\text{P.E. Diff.} = \sqrt{(\text{P.E. Med.}_x)^2 + (\text{P.E. Med.}_y)^2}$$

we get a result of 6.88, or practically 7.

Most statistical authorities agree that a difference should be at least four times the P.E. of the difference if it is to be regarded as significant, and in view of the fact that the difference arrived at here is almost 7 times the P.E. we may conclude that it is significant.

There seem to be two ways of explaining this difference:

1. That there actually is a sex difference in the Performance test.

2. That there is an actual difference in the mentality of this type of mother as contrasted with this type of father.

As regards point 1 there is no confirmation from other sources that a sex difference exists, and until such a confirmation is forthcoming, this interpretation of the difference must be discarded. On the other hand, observation during the collection of the data, created the impression that the difference is to be explained under the second heading, and this impression is amply fortified by the experience of the social workers of the institution. According to them, an intelligent mother who has the earnings of a husband of lower mentality than her own to fall back on, can generally manage to provide for a mentally deficient child, and the social workers practically never oppose a discharge in such a case, unless there are other complicating factors. When, however, the mother is low grade, they find her unable to control the other children or to preserve even a semblance of order and cleanliness in the house. In such cases they vigorously oppose an application for discharge, and experience has taught that a very short time elapses between discharge and an application for readmission.

Eliminating then the conclusions that all mothers are of lower intelligence than their husbands, and that all mothers of feebleminded children are of lower mentality than their husbands, it seems safe to conclude that in the cases of children who are inmates of institutions for the feebleminded, there is every likelihood that the mothers will be lower mentally than are the fathers. It seems then that the institution, besides selecting from an inferior social group, and from fathers whose intelligence is low for their occupational group, is also selective of incompetent mothers. Certainly we may say that in a biological sense the mothers in this group are parasitic, since if they did not have the earning capacity of the fathers behind them, they could not survive in the struggle and would eventually have disappeared or drifted to some state institution.

These findings together with those from other sourcesthat emphasize the relation between deficiency and delinquency (Miner, *Deficiency and Delinquency*) constitute a strong plea for a rigid supervision of cases paroled from institutions for feebleminded women, as well as of degenerate or cacogenical marriages (Wallin, *Problems of Subnormality*).

Except from the point of view of mentality, where the comparison is close, the women in this study are hardly comparable to those studied in connection with delinquency and criminality. They are presumably moral, and possibly an element of stability lacking in the other cases keeps them from contact with the law. Possibly too, the regulative effect of marriage, with all its social implications for this class, may have the effect of inhibiting tendencies that would have been brought into play if they had remained single.

Conclusions drawn from this section

1. That the fathers of this study form a social group of low intelligence when compared with a group whose occupations are similar.
2. That the mothers of the group are even lower than the fathers.
3. That the typical family sending a child to a public institution for the feebleminded is of medium occupational status; the average I.Q. of the father being approximately 73, rating low for his occupational group, while that of the mother is still lower, being approximately 64.

IV. RELATION OF THE DATA TO CAUSES OF FEEBLEMINDEDNESS

So far the data have been considered from the point of view of their clinical and sociological bearings. Since however the study concerns itself with primary aments, it is necessary to state the position with reference to the causes of amentia and to show the relation of the data to those causes.

Faced with the teachings of biology, it seems logical to conclude that the individual begins its existence from the time of the fertilization of the female ovum by the male sperm, and from this point of view the factors causing amentia may be regarded as being operative at three different but successive stages:

1. Before fertilization
2. During fertilization
3. After fertilization

1. Postulates some defect in the germ plasm of one or both of the parents, such defect being either native or acquired;

2. Postulates in addition the possibility of the union of unsuited germ plasms, such as would be the case in consanguineous marriages;

3. Postulates some toxic or traumatic agent that affects the fetus to its detriment.

Walter in his *Genetics* gives the following convenient classification of conditions that may influence the germ plasm of parents to the extent of causing variations harmful or otherwise in the offspring: (*a*) mutilations; (*b*) environmental effects; (*c*) use and disuse; (*d*) disease. It is with the last of these that we are concerned. Taking this in connection with what has been said before we may tabulate the causes of amentia in the following manner:

1. Before fertilization:
    - Neuropathic ancestry
    - Diseases of parents
    - Alcoholism of parents
    - Syphilitic condition of parents
    - Toxic condition of parents owing to occupation (industrial poisoning)
2. During fertilization:
    - Consanguinity
    - Disparity in ages of parents
    - Old age of parents at conception

3. After fertilization:
    - Injury to fetus due to toxic or traumatic factors
    - Mental state of mother
    - Primogeniture
    - Premature birth
    - Abnormalities of labor

The position taken in this study is that only in the presence of factors operating under 1 and 2 can we properly speak of primary amentia; and that in the case of factors operating after fertilization we are really dealing with cases of secondary amentia. The writer is well aware that this is in the nature of a *reductio ad absurdum*, in that it makes it impossible to decide whether a case is one of primary or secondary amentia. It is however respectfully submitted, that where one parent, or both parents, is or are proved to be subnormal, by a test which has been standardized and well established, we have every justification for concluding that such parents are capable of transmitting defective germ plasm, and that it is illogical and unnecessary to regard other factors as causal when this has been proved.

It may be as well, before beginning a discussion of these points in detail, to clear the board as far as the common infantile diseases are concerned. There may yet be people who think that such illnesses as measles, whooping-cough, etc., may cause feeblemindedness. It is difficult to see how they arrive at this position in the face of the number of clearly authenticated cases to the contrary. It lies in the experience of every observer to bring forward cases of children who, though they have had these diseases, have suffered no impairment of their mental capacities. Similarly many people are of opinion that pneumonia is a cause of amentia. The popularly known "Spanish influenza" was to a large extent succeeded by or complicated by pneumonia, this being the most fruitful cause of death. Numbers, however, survived, and if pneumonia causes feeblemindedness, then there must have been a great increase in the number of aments in the years immediately succeeding the visitation. Such an increase must have been of alarming proportions, yet not only has it attracted no attention up to the present, but inquiry has failed to show that the increase has been abnormal. In these 45 cases we have 20 children who have had no illnesses, while some of the remainder have had one or two of the diseases of childhood and some have had something graver. The position is most probably best summarized by Tredgold, who says, "Amentia is rarely caused by injurious factors operating alone." In his view the prerequisite is what he calls a "neuropathic diathesis," which means that the offspring are the outcome of germ plasm already tainted.

Many present day biologists do not think that any of the factors cited under 1, can be regarded as having any effect on offspring. They claim for the germ plasm an inviolability to the effects of environment that enables it to transmit the parental characteristics, other than those acquired, unimpaired and unmodified. It must in all fairness be said, however, that all biologists do not hold this view, and that a very fair case based on the close relation of epithelial tissue and germ cell can be made out, is shown in a brief but pungent essay by Morley Roberts in *Warfare in the Human Body*. The chief protangonists of this point of view are Kammerer, MacBride, and Guyer. Moreover in Science (June 16, 1922) Conklin is quoted as supporting the view that chromosomes and cytoplasm are environments to each other and that it is impossible to assume that all factors for heredity and differentiation are located in the chromosomes.

Alcohol

The important part played by heredity or the neuropathic diathesis in amentia has already been discussed in section II and it is proposed to go on to the consideration of alcohol as a cause of germinal variation harmful to the offspring.

Besides syphilis, there is no subject which has been so much disputed, and each side seems to be able to bring figures in confirmation of its own point of view. Most of the evidence adduced in this case, as well as for other factors, has been reviewed by Holmes in *The Trend of the Race*, where he points out that the experiments of Stockard can be paralleled by those of Pearl and Torelle. Tredgold says that 46.5 of his cases showed a family history of alcoholism but adds that in five-sixths of these there were evidences of neuropathic ancestry, and that the remainder showed a history of some other morbid influence. The authorities he cites show such discrepancies that we should be careful of accepting a point of view that may be more partisan than an unbiased expression of opinion. Everyday observation will give us many cases of mental deficiency in children where the parents were alcoholic, but it will also give us cases where, the same condition pertaining in the parents, the children showed no signs of degeneracy in mental traits. There are no figures to show that the percentage of the feebleminded in nations that habitually use alcohol, is greater than that of those who use it to a lesser degree. It is not denied that such nations may have immunized themselves to the effects, and the devastation caused by alcohol among savage tribes previously unacquainted with it are often quoted, with how much justification it is difficult to say. On the other hand the Scotch people are quoted by Pearce Baily (Mental Hygiene, 1920–1924) as being more addicted to the use of alcohol than the American or English peoples. At the same time according to the same authority the Scotch show a smaller percentage of feebleminded than either of the two other nations mentioned.

It seems then that the mere record of alcoholic tendency is not enough to explain the matter of mental deficiency. Tredgold thinks that the discrepancies between the authorities whose figures he quotes, may be explained by regarding alcohol as contributory rather than causal, and Goddard says he can find no conclusive evidence from his charts that the condition of the child in question was due to the use of alcohol by one or both of its parents. It seems that more time has been spent in finding out what alcoholism causes than what causes alcoholism.

Alcoholism is more common among feebleminded persons and those of inferior neuropathic constitutions. This contention is abundantly borne out by the returns from prisons and reformatories, and this fact, together with the incidence of alcoholism in families where there is definitely marked feeblemindedness, seems to point to the conclusion that, instead of alcohol causing feeblemindedness, it is really one of the consequences of that condition. American investigators, however, will have opportunities in the following years of testing this popular theory. Unless the illicit sale of liquor manages to reach the same proportions as the legalized sale before prohibition, then there should be a marked decrease in the returns for feeblemindedness in the generation following the passage of this measure.

Syphilis

Another cause popularly regarded as being a fruitful cause of amentia is the syphilitic condition of one or more of the parents. Here again we are faced with as many contradictory arrays of facts as we were in the case of alcohol. That syphilis is, in the ordinary sense of the word, hereditary seems hardly possible when we remember that the implication is that there is a possibility of the offspring inheriting a disease germ. On the other hand, if in spite of the fact that the placenta is a fairly impregnable filter, the germs can pass through the chorion cells and affect the offspring; there is no way of proving that such offspring was not feebleminded before being infected. Nevertheless, here again cases of syphilitic parents with normal offspring can be brought forward to offset cases where syphilitic parents have feebleminded children. There are also authentic cases where the father becoming infected and the infection having been transferred to the mother after pregnancy, the offspring remained unaffected. Furthermore this has been noticed to happen both before and after the formation of the chorion cells.

The facts then seem to be of such a nature as to make the assumption on priori grounds, that the syphilitic condition of one or both of the parents causes mental deficiency in the offspring unwarrantable.

It was hoped at the beginning of this study that it would be possible to get a Wassermann of each of the parents. It was even predicted that it would be easier to get the parents to submit to the Wassermann than to psychological examination. Experience proved the contrary to be the case. Very little difficulty was encountered in persuading them to take the test, whereas the request for a Wassermann was met by refusals ranging in character from the hysterical to the indignant. As there was no machinery for enforcing the taking of this test, the project had to be abandoned not however, before a certain number had been taken. There is a general impression that those parents who made higher scores looked at the matter from a much more sensible standpoint and were in some cases eager to have the test taken. It must be noted in this connection that the absence of a positive Wassermann is no proof that the person giving this reaction is not syphilitic, and on the other hand nobody who has had great experience in working with the test would hesitate to acknowledge that the positive reaction must be regarded as symptomatic rather than as irrefutable proof. The percentage of syphilitics in the normal population is 10 (Dublin and Clark, Social Hygiene, October, 1921) though this most probably includes cases that would not from the clinical point of view be regarded as syphilitic. The register on Randall's Island shows the percentage among aments to be 4. There is no reason to believe that, except so far as the number is restricted and may in this way give a higher percentage, the actual percentage for parents or patients would be much higher than the figures quoted.

Of the children who figure in this study, none of those who were tested has a positive Wassermann; of the 24 parents who were tested, 2 gave positive reactions. It is here again significant that in Goddard's study the larger percentage of cases where there was a syphilitic condition in one or both of the parents fell in the hereditary group. Tredgold too thinks that the result is largely influenced by the presence or absence of neuropathic taint. Though we must admit the possibility of offspring being infected in utero, and the further possibility that such infection may go to the extent of causing impairment of mental functions, yet we cannot say that the syphilitic condition of one or both parents *ipso facto* causes feeblemindedness in offspring. The syphilitic poison, says Tredgold, "seems to have the predilection for finding out the weak spot, and if a predisposition to nervous weakness exists, the chance of the child of syphilitic parents being mentally deficient seems to me to be very considerable; in the absence of such it may possibly escape." Goddard says, "A glance at the distribution of the syphilitic cases shows that there is little evidence that syphilis is a cause of feeblemindedness."

Tuberculosis

Tuberculosis with other morbid conditions of the parents has frequently been considered one of the causes of amentia in offspring, but it is quite evident that such an opinion rests on a very slight basis. History offers many cases of persons who have been brilliant intellectually although they were tuberculous, and there are numerous instances where such people have had normal or even intellectually superior children. Goddard's charts show that the cases of tuberculosis found in his study, when charted, can only be accounted for by contagion. Tredgold's evidence is less positive in that he thinks that it may have an important influence though indirect and contributory. These indirect effects, however, are seen to be not characteristic of amentia, either primary or secondary. It seems much more likely that the feebleminded who are incapable of exercising proper care over themselves should contract tuberculosis, and that here also there has been a confusion between cause and effect.

Goddard has further data as regards paralysis, epilepsy, etc., and finds nothing to prove that these are causes of amentia in the absence of heredity.

There is a possibility, though a very slight one, that in certain industries where the parents are exposed to toxic conditions, the poison absorbed into their systems may be harmful to their offspring. The data on this point seem to be very slight and loosely worked up and by no means of a nature to justify the formation of a definite opinion.

Consanguinity

The most important of the causes of feeblemindedness under the second heading is consanguinity, which has for a long time been regarded as a prime factor operating to produce that condition. That there is nothing to substantiate this is evident from the works of both Tredgold and Goddard. The latter takes each case of consanguinity as it occurs in his charts and finds only one case in which the parents, though normal, were cousins and had two feebleminded children. Here however, the mentality of the grandparents had not been determined.

In only two of the many cases reviewed as possible subjects for this study were the parents related. In one there were two children, both microcephalic; in the other comprising also two children both were aments but not suitable for this study on other grounds than those just mentioned above. In the first case, the two children were the result of three possible pregnancies, the mother having menstruated only once between the two pregnancies. However, the mother's sister had also married her cousin, a brother of the father in the case under consideration, and the children of this union were according to report perfectly normal. The normality of these children may have been exaggerated, but at least they did not attract attention.

Far from consanguinity being regarded as a cause of amentia, it is an open question from the point of view of some geneticists whether judicious inbreeding might not make for improvement. It is highly probable that a mating of two persons of neuropathic taint increases the possibility of the defect appearing, since the child is the result of the union of germ plasms which in their union double the factors causing the defect, but that consanguinity in itself causes mental deficiency does not upon the strength of the evidence offered appear likely. Similarly the contention that old age of the parents or disparity in their ages at the time of conception causes feeblemindedness rests on a very slight basis. Equally insignificant is the contention that primogeniture or order of birth has any effect on the mentality of the children.

Looking at the data on page 103 we see in the table for the lower scores that 75 per cent of the parents have I.Q.'s falling below 70.8. The discussion has emphasized the inferior standing, intellectually and socially, of the group and the excessive inferiority of the mothers. What conclusion is then to be drawn from these facts? Is the subnormality of the children to be attributed to environmental effects, or hereditary influences, or to both? The simple explanation of heredity is sufficient to account for physical feature. Why should that explanation not serve here? It is true that because of selective influences no general deductions can be made as to heredity and mental deficiency from the data collected for this study. At the same time there is a strong suspicion, based on these findings, that for this type of the general population the heredity influence is the prime causal factor.

CONCLUSIONS

1. The children selected for this study are a fair sample of mental defectives committed to a public institution.

2. Of the 45 cases figuring in this study, selected as being admissible to a public institution and as having no history of epilepsy nor convulsions, 33 or 73.3 per cent have one or both parents who are themselves below the borderline. These may be classified as cases of primary amentia in which immediate heredity is an important factor.

3. Of these mentally defective parents, 30 were mothers 13 were fathers and in 11 cases both father and mother were defective.

4. The mothers are on the whole lower than the fathers (71 per cent of them being actually below the fathers) and

the difference between the medians is significant of a real difference in mentality between these fathers and mothers.

5. Three of the children tested are brighter than their parents; 8 lie midway between their parents; and of the remaining 30, 4 are lower than their parents.

6. The fathers form a group relatively low in intelligence for their occupational status.

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THREE CHILDREN OF SUPERIOR INTELLIGENCE AND INFERIOR MOTOR ACHIEVEMENT[1]

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The three children to be described in this article were all characterized by superior intelligence and inferior motor achievement.[2]

The first two typify many a gifted child who because of precocious book learning alone has been launched upon his entrance into school into a relatively advanced grade, where he meets with children who have had the opportunity for well-rounded development in all the subjects of the school curriculum. At the time of psychological examination, John, not yet seven years old, was in the third grade; and Mary, six years old, in the second. Their mental ages, as reflected in their respective intelligence quotients of 140 and 158, were nine years, eight months, and ten years, two months, respectively. Their intellectual work was satisfactory,—both were leaders in the literary life of the grade in which their academic achievement had placed them,—but they were inferior in motor activities. Thus, though their days in school were still so few, the incentive to improve which would come from success in mechanical work seemed already denied. Their cases raise the problem whether a child because of unusual talent manifested in one group of subjects should be automatically deprived of rudimentary training in those subjects in which he has not yet had experience, and which under favorable circumstances he may therefore never have opportunity to attempt.

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[1] This manuscript was received for publication from Miss Chassell while she was Instructor in Psychology, Ohio State University, Columbus, Ohio.

[2] For the records in the psychological examination and for general coöperation in the study, the writer is indebted to Clara F. Chassell, School Psychologist of the Horace Mann School, Teachers College, New York City.

The third child typifies the mentally gifted pupil who has no talent for tasks of the hand, and, despite every opportunity from early childhood up, remains inept in motor activities. At the time of psychological examination James was eight years old; unlike John and Mary, he had, except for skipping one-half year's work, progressed regularly in school, beginning with the kindergarten, and was then in the third advanced grade. His mental age was twelve years, one month, and his intelligence quotient, 149. He, too, did good book work, but he was the despair of his industrial arts teacher. His case raises the new-old problem whether a child should be required year after year to persist in a school subject from which he seems by nature denied benefit, and through which he is trained in habits of wastefulness of time, effort, and materials, and in expectation of failure.

We shall consider each of the children in turn, indicating the particular problem which occasioned the study, the procedure followed in its solution, and the results of the investigation.

Because of marked inferiority in writing, John was referred for psychological examination by his teacher, who wished to be advised regarding penmanship methods. An illustration of his extreme backwardness in this subject is the fact that when subsequently tested he consumed nearly two minutes in drawing, "See the liittle boy," the product measuring 9 on the Thorndike handwriting scale.[3] Early tests given by the school psychologist, including the individual intelligence test, performance tests, and tests for right- and left-handedness, indicated high intelligence, but suggested no clue to his difficulty. A subsequent interview with grade teacher or mother, however, gave a probable explanation.

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[3] The rate was thus only about one-half that which would be required of an average eight-year-old, though the quality was satisfactory.

He had never before studied writing though in the third grade, having been placed there upon his first entrance to school, only two weeks previous to his reference for psychological examination, because of his proficiency in academic subjects. Yet it was not possible to predict to what extent he would profit from instruction in handwriting. Further investigation of his motor capacity and special lessons in penmanship seemed advisable, and his case was referred to the writer.

Problems which seemed worthy of investigation were the following: Did he have some motor disability which would be revealed by motor tests or by his school work in motor subjects? Did he use the less skillful of the two hands in writing? Was he immature in physiological development or did he have some special physical defect? Looking toward the solution of these problems, further tests of the same general character as those already used were given and in addition handwriting and physical tests; the grade teacher, the special teachers, and the mother were interviewed; the school records of his physical examination were referred to; and special writing lessons were given.

Omitting the handwriting tests, which are to be reported later, the collective results of these tests considered together with those previously given by the school psychologist, pointed to normal motor and physical development, as did the results of the larger number of the tests considered singly. They therefore do not warrant detailed quotation here.[4] The tests for right- and left-handedness, though possibly indicating an original preference for the left hand,[5] pointed to ambidexterity at the time of the examination; they thus did not furnish sufficient justification for a shift from the right to the left hand.

Interviews with the teachers indicated a less satisfactory condition. Though his academic work, particularly his

[4] The results of these tests and of similar ones for the other children studied are given in the appendix of a more extended form of this article, on file in the Horace Mann School.

[5] That such a preference actually existed in babyhood was later confirmed by the mother.

reading, was satisfactory,[6] his school work involving motor control was inferior. In gymnastic exercises he was reported as being rather stiff and slow though having a good sense of rhythm; and in art as doing beautiful brush work at the outset but never accomplishing a finished product. Handwork was stated to be the most unsatisfactory phase of his school work by his grade teacher. However, none of the shortcomings in the motor work appealed to the teachers as serious.

Reference to the records of the physical examination brought out the fact that he had nystagmus, which might lead to slowness in reaction, and vision which was still somewhat defective, though an attempt had been made to correct it with glasses; also, that he exhibited doubtful evidences of chorea in a mild form.

Most significant of all the data secured, however, were those relating to his improvability in handwriting. It was clearly demonstrated by his response to the writing lessons, seriously interfered with though they were because of a complication of circumstances, and by his progress in penmanship during the succeeding days in school. Both of these were measured by the handwriting tests previously referred to. To be compared with the specimen, "See the liittle boy," requiring for its laborious execution approximately two minutes and measuring quality 9, is the specimen secured some two months later; though almost seven times the length of the first, it was written in perhaps four times the time, averaging fourteen letters a minute, and measured very nearly quality 11. As compared with the second specimen, a third, identical in content, written a month later, showed a gain of slightly over two and one-half letters a minute, and would undoubtedly measure quality 11. His progress in school was also indicated by a second report from his teacher to the effect that he was then able to keep up with the other children.[7] Moreover, having once been given a fair start, he took great interest in penmanship according to the report of the mother (who was planning to continue the special lessons), and spent considerable time practising. Thus with a very limited amount of training he was able to hold his own and was even finding the subject attractive.

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[6] His work in reading was said to be very superior. Frequently he would dramatize a book he had read and impersonate the characters. He was gifted as a story teller. Both unusual home training and unusual heredity were responsible for his literary precocity. His mother began his instruction when he was but one year old. At eighteen months of age he knew all the letters of the alphabet; and when not over two and one-half or three years old, would pick out letters in car signs and newspapers. His maternal grandfather was a writer and a member of the Authors' Club.

To be compared with this outcome is that in motor subjects in which he was not given special help. In these, although the examination had shown him to have no innate motor handicap, he continued to be backward, being reported as below average at the close of the second quarter in fine arts and industrial arts, and during the following semester in physical education, fine arts, and industrial arts; also, during the following school year[8] (until the fourth quarter when because of leaving school he vanished from observation) as below average for one quarter in industrial arts and for all quarters in physical education.[9]

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[7] His improvement was clearly reflected on his report card. At the end of the first quarter his penmanship grade was "fair"; at the end of the second, "good"; and at the end of the third and of the fourth, "excellent."

[8] When a new system of reports was adopted which made special mention of subjects in which the pupil was above or below average, those that showed particular improvement, and those in which the child apparently was not working to the best of his ability. See, "A scale for measuring the importance of habits of good citizenship (with description of its use in a new report card at the Horace Mann School)," by Siegried Maia Upton and Clara Frances Chassell, reprinted from Teachers College Record, vol. xx, no. 1, January, 1919.

[9] John was still below average in "system" at the close of the year during which the special study was made, as he had been for the three quarters preceding; during the following year, when records based on an analytical study of habits and attitudes were first available (see reference cited), he was reported one quarter or another as needing careful training in care of materials, but showing marked improvement in three habits involving promptness of motor reaction.

Thus, upon analysis of the case, John's basic difficulty proved to be the fact that he had been allowed to approach motor activities presupposing two or three years' training with no systematic preparation. He was in consequence but another child destined, though in all probability needlessly, to experience for a longer or a shorter time the discouragement which comes from inferiority.

In the course of individual psychological examination of the second-grade children, Mary was found to earn a remarkably high intelligence quotient despite her failure in motor tests. This failure proved to be consistent, characterizing all motor tests in year VII and upwards of the Stanford Revision.[10] It seemed desirable that special attention be given to training in motor activities, and her case was referred to the writer for special study. Information regarding the following points was sought: her motor ability as reflected in school subjects involving motor control and in motor tests; her physiological development and possible physical defects; her developmental history and heredity; and her response to special training in a motor subject. The procedure was similar to that followed in John's case.

In all activities which involved motor control Mary was below the average. The reports of the teachers were as follows: In gymnasium work she was slow and clumsy and did not respond well to rhythm. In art though she worked very earnestly she worked very badly, "wallowing" in color. In industrial arts her work was more encouraging; her attitude was good, and her difficulties, which might easily be due to lack of experience, would probably be subject to improvement. On the whole, her performance in the motor activities of the school confirmed the test results.

The results of the motor tests indicated that Mary was considerably above the norm for her age in tapping and showed satisfactory ability in the form-board test, but was below the norm in strength of grip, and failed completely in the steadiness test. In the deficiency in both strength and motor control thus revealed was probably afforded a partial explanation of her motor inadequacies.

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[10] She was unsuccessful in but three non-motor tests below year XII; and did as well proportionately in the tests for this year, where no motor tests are scheduled, as in those for year VII, among which are two such tests.

Normal physiological development was indicated by the physical tests, but defects were found to be present upon reference to the records of the physical examination. They were probably not sufficiently serious, however, to affect her motor activities. Taken as a whole, therefore, the tests and the examination of the physical records afforded little of significance toward the solution of the problem.

Data concerning Mary's developmental history and heredity brought out the fact that her father was admittedly weak in activities requiring manual skill.[11] Thus Mary's inferiority in school tasks involving motor control was but natural. Moreover, the family was Jewish; if weakness in motor performance is characteristic of the race, as some believe, her lack of skill had a further hereditary basis.

Fewer special writing lessons than planned were given; the program was postponed by illness and interrupted by absence. Yet, though she did not have a sufficient number of lessons to counteract the effects of her finger movement and the one-space-high writing required by her grade teacher

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[11] Much interesting information regarding her literary and dramatic ability was secured. She had rhymed since two and one-half years of age, and had consistently given indication of literary talent.

During her subsequent school career she established for herself, first in the elementary school and later in the high school, a position of literary leadership. Her first productions to be printed, a poem and a story, were published in the school quarterly when she was but eight years old, and were the only contributions from the elementary school to the number in which they appeared. The poem is as follows:

The Blue Bird

And now on sapphire wings, thou art borne through
A larger sapphire of a purer blue.

There was much in Mary's heredity on both sides which would explain her unusual talent.

(despite its being more difficult for her to execute than a smaller hand), measurement of her efficiency in handwriting at the beginning of the special instruction and at the close showed some gain in speed; the first specimen averaged twenty letters a minute, and the second, about six letters more. Measurement did not show change in quality, however; specimens of her writing in the small hand would measure about quality 9 on the Thorndike scale.

To the information already given should be added the fact that not before this year, though in the second grade, had she been in school and had an opportunity for systematic training in motor activities. The full significance of this fact is apparent upon an examination of her subsequent school career. During the following year she was reported as showing particular improvement from two to four quarters each in fine arts, industrial arts, and penmanship, and as above average for one quarter in physical education.[12] During the second year the records were too fragmentary to give a satisfactory indication, though one report in fine arts and two in penmanship indicated achievement below the average.[13] The third year, with the exception of one quarter in physical education, she was consistently reported as average or above. Even the hereditary handicap seemed to yield when she had been in school long enough to receive a considerable amount of training.[14]

Thus Mary was facing, though in less extreme form, the problem that was John's, having been plunged into motor activities without the necessary rudimentary training, and this despite the fact that she was very probably somewhat less endowed than the average in motor ability.

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[12] These reports and those for subsequent years were made in terms of the new system of records, previously described, or its revision.

[13] These were the only reports during the year of her work in motor subjects.

[14] Like John, Mary received reports showing some difficulty with motor habits. These continued for two years. The third year, however, she had no unfavorable reports of this character.

James was given a psychological examination at the request of his industrial arts teacher, who found it impossible to secure good handwork from him and wanted to know the causes underlying his deficiency. The psychological examination furnished but little information from the standpoint of which his motor difficulties could be understood, for he both succeeded and failed in motor tests. It did bring out clearly, however, his superiority in mentality and his indifference in attitude. The latter trait was so pronounced that it might very well have affected the intelligence score. He was referred to the writer for further examination and observation. Similar facts to those obtained in the case of Mary were sought, and the same general method was followed.

From the teachers' reports of his ability in the motor subjects, it was apparent that James was incompetent in motor activities; but mention was so frequently made of his instability and indifference as a factor in this deficiency that it was perplexing at the outset to tell which was the cause and which the effect. Thus, for example, his gymnasium teacher said that he had no coördination, but the lack was due in large part to carelessness and failure to apply himself.[16] The art teacher made a more elaborate report similar in character. His grade teacher supplemented the description of his work in physical education, and added other items of interest. He did not do well in rhythm, and, so far as physical exercises were concerned, was the poorest child in the room; but was good in any kind of work which did not require the use of his hands. On the whole he was rather indifferent and listless. Both she and the gymnasium teacher, however, spoke of his showing improvement. His industrial arts teacher, at whose request, as previously stated, he was examined, made the most unfavorable report. His work was thoroughly unsatisfactory and discouraging; for instance, a little cart which he had made and was taking home was so poorly constructed that by the time he reached home, not a nail was left in it. He had had special training in handwork for two years and had been allowed for the most part to follow his own interest in his industrial arts work, yet he had shown no improvement and still remained indifferent as to the quality of his product and as to the amount of material and time he had wasted.

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[16] Yet he received a grade of "good" the first three quarters of the year, and only the fourth quarter a grade of "fair."

The same combination of motor inefficiency and indifference was encountered by the writer in connection with the special instruction in penmanship. Only under pressure, which was resorted to after leniency had failed, did signs of improvement appear.

Though, because of the coöperation of these two traits, it was difficult to estimate with certainty the relative responsibility of each in the production of his incompetence, it seemed reasonable to suppose that James had a real motor difficulty; and also that this deficiency, exaggerated as it doubtless was by his attitude, was less than the quality of his achievement indicated.

That there was a genuine deficiency the results of several of the motor tests confirmed. His performance was inferior or wholly unsuccessful in the tapping, the tracing, and the steadiness tests, and also in the form-board. To secure data to show ability to handle the tracing test even slightly, a larger number of trials than usual was allowed;[16] yet the average of his records when many of the lower ones had been discarded was unsatisfactory. He failed completely in the steadiness test; only if allowed to use both hands and to support them as much as possible could he hold the stylus in the largest hole without making a contact. He showed normal development, however, in the tests for strength of grip and in most of the physical tests. His deficiency, therefore, appeared to be not in strength but in motor control.

The physical records contributed but one meager suggestion to the explanation of his motor inferiority. They indicated, on the whole, a rapid physical development; and possibly the muscular development had not been able to keep pace with it.

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[16] His records were thus not comparable with those taken when the usual procedure is followed.

James' personal and family history contributed further information for the problem. Like Mary, James was of Jewish parentage. His development had been late in several respects. This fact and others that were ascertained pointed to the probable inheritance of a none too sturdy physique and the possible inheritance of nervous instability. Moreover, his arms were weak though he was strong in other respects and did not tire. Although relatives on the maternal side had excelled in sports, even winning prizes for athletic achievement, and he had been given special encouragement and opportunity in athletic activities, he seemed to be satisfied when he did poorly. Also, he was lazy physically, though absolutely fearless.

That James' deficiency could be considerably counteracted by the proper kind of training and method of procedure seemed very probable. As noted before, he was reported as showing improvement by two teachers and made some progress in penmanship when under pressure. Though this improvement did not show itself in the speed or the quality of his writing (the rate when first measured was twenty letters a minute, and the quality about 7), he did improve in ability to use the muscular movement,—he was even able at the last to write some words with correct coördination.[17] Moreover, when under observation by the writer in an industrial arts class, he showed considerable improvability in sawing.[18] In the hope that this improvability would be capable of extension to other aspects of his work, the recommendation was made that he be given a definite amount of drill work for each day until he could do the fundamental processes required for the simplest work in wood. His teacher, therefore, planned exercises in measuring, sawing, boring, and similar operations. She found subsequently, however, that he was exceedingly restive under this type of drill and only under the closest supervision accomplished results at all worth while. After the conclusion of the special study[19] he continued to be reported as below average in this subject, and indeed in all motor subjects except physical education, in which he received but one report as below average. The next year he was reported the first quarter as below average only in penmanship; and during subsequent quarters, with the exception of penmanship, only in fine arts.[20] Strangely enough he was not reported once in industrial arts or in physical education; however, in the recollection of the industrial arts teacher, who was interviewed when the follow-up study was made, he did not achieve sufficient proficiency in handwork to merit exemption from report.[21] The following year he entered another school, and further follow-up work was not attempted.[22]

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[17] He was given 16 lessons; 10 were one-half hour in length and 6, fifteen minutes.

[18] The circumstances were as follows: When first observed he was sawing vigorously and heedlessly. Noticing finally that each pull of the saw was carrying him farther from his mark, he began to saw in reckless fashion from the opposite direction. When the piece fell off and disclosed a remarkably jagged edge, he rushed away to find a plane; and, returning, proceeded to chip off some of the irregularities. Upon the writer's suggestion that he begin a second task with care, trying to follow his mark and steadying the saw as he worked, he took considerable pains and succeeded fairly well. Moreover, he had similar success immediately afterward when sawing to a third line.

Sufficient evidence seemed to have been collected, however, to indicate that James would never have adequate motor skill to produce handwork products the worth of which was at all commensurate with the time and effort consumed on his part or on the part of the teacher; and that in pursuing the subject he was developing habits altogether inimical to a happy school career. Thus James was but another child who had been doomed to continue from year to year a required subject from the pursuit of which there was accruing an ever greater and greater net loss.

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[19] Shortly before the close of the second quarter.

[20] In this subject he received one report as below average.

[21] The reports for this year were made according to the new system of reports.

[22] Like John, James was below average in system the first semester of the year when the special study was made, though he showed improvement the second semester. Moreover, the next year he was reported as needing careful training in certain motor habits.

NOTES AND NEWS

FROM THE MINUTES OF THE PHILOLOGICAL CLUB, THE UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL, N. C., DECEMBER 10, 1023

The members of The Philological Club of the University of North Carolina, believing that large numbers of their German colleagues will suffer for the necessities of life during the coming winter, and actuated solely by the motive of contributing what they can to the salvage of human vitality and intellectual production in a class that during times of need suffers the greatest privation and receives the least aid, hereby authorize their President to appoint a Committee of three, whose duty will be to secure from each member of the Club a pledge for whatever amount he will give, to be divided into four installments and collected at regular intervals during the remainder of the academic year, and forward the same to their German colleagues in the following manner:

The Committee will select from the faculties of German Universities a Professor of German, a Professor of Romance Languages, a Professor of one of the classical languages, and a Professor of English who may be known either personally or by reputation to members of the Club as willing to undertake the distribution of the Club's gifts; the Committee will forward one collection to each of the professors chosen, with the request that he put the same to the best use in relieving whatever want appeals to him as most urgent among teachers of his subject personally known to him, retaining for himself, if he so desires, as much as one-third of the amount sent him.

Realizing that their contributions will go but a very little way towards alleviating a great deal of suffering, the members of the Club hereby instruct their Committee to ask the editors of whatever publications the Committee may select, to publish these resolutions, in the hope that the Club's procedure in this instance may encourage like actions being taken by similar organizations throughout our country; and furthermore the Club instructs its Committee to secure the promise of the most available among those members of the Club who will attend the approaching annual meeting of The Modern Language Association to bring a similar resolution before that body.

BOOK REVIEWS

J. E. W. Wallin. *The Measurement of Mental Traits in Normal and Epileptic School Children.* Miami University Bulletin. Series XXI, no. 8, April, 1923. Miami University, Oxford, Ohio. Pp. 175. Price 75 cents.

This research was carried out with epileptic and normal school children during five successive months, and a comparison is made of the improvement of the children on the tests as they were given on the successive sittings. The normal children were pupils enrolled in the second to eleventh grades in the Hopewell New Jersey Public Schools and the epileptic children were in attendance at the New Jersey State School at Skillman. Seventy-six normal pupils were used in the experiment. They were selected subjectively by the teachers in each grade, the teachers selecting two bright boys and two bright girls, two average boys and two average girls and two dull boys and two dull girls from each grade. The 30 ablest epileptic children were selected from the State School. The epileptic children were older on the average than the normal children but they were inferior or less mature mentally as is shown by pedagogical status and by their mental age.

Extensive sets of group tests were used and a chapter is given to each test describing the test and giving the results of both the normal and the epileptic children. The tests were such as memorizing visually presented numbers, rapidity of thinking, addition tests, controlled association, attention and perception, observation, memory of logical and illogical association, recognition, and speed of motor reaction (instead of using the usual tapping test to determine motor speed, Dr. Wallin conceived the idea of having the subjects make circles).

As a result of these tests, Dr. Wallin concludes that the epileptic children made less improvement in genuine mental capacity than the normal children. Even after making the large gains registered in the tests, the epileptics were still inferior to the normals. The improvement of the epileptics as is given by the tests, show that the most profitable form of training for them should be sensory, motor and individual in character.

M. La Vinia Warner,
Ohio University.

Zenas Clark Dickinson. *Economic Motives (A Study in the Psychological Foundations of Economic Theory, with Some References to Other Social Sciences.* Awarded the David A. Wells Prize for the year 1919–1920. Harvard University Press, Cambridge, 1922. Pp. vii and 304.

Economic Motives "grew out of a doctoral thesis presented at Harvard University in 1919 . . . ." The field that Professor Dickinson aims to cover "may be called the psychological problems and postulates of economics, which are most conspicuous, of course, in the matter relating to wants, self-interest, value, interest and wages." The main purpose of the book "is to gather up whatever material is to be found in psychological science that offers help in dealing with the above problems, and to present this material briefly in a manner intelligible to the economist or other social scientist" (p. v).

To say that Professor Dickinson has been successful in his undertaking would be folly. The book contains a sketch of certain phases of the history of psychology—which phases concern themselves chiefly with the psychologies which assume the existence of the instincts as fundamental human drives. Because Professor Dickinson found confusion in this realm of psychology he aimed to evolve and construct deductively his own set of fundamental human instincts. The attempt is a crude one—as, from similar failures of other economists, one might have predicted; in fact, it reminds the reader of the late Professor Parker's endeavors in the same realm. He fails to profit by his study of Hobbs while such men as Cabanis, Locke, Hume, Herder and Reinar are not even considered. In fact his attempted study of English empiricism omits some of the most important members of that school. Had Professor Dickinson studied these writers he would not have limited himself so exclusively and fatally to those psychologies which assume the existence of instincts as entities.[1]

Consequently, we find Professor Dickinson in the first two hundred pages of his book, discussing, and attempting to reduce the confusion among the writers on instincts, and in the remaining seventy pages suggesting in a highly speculative and deductive manner the application of the doctrine of instincts in the problems of economic theory, but always limiting himself entirely to a consideration of one school of psychology. There are a few cases when he finds that his notion of the existence of instincts does not always supply the necessary psychological foundations for the historical doctrines of the marginal economists. Then he proceeds to find other psychological notions and to shape these into the mold of the accepted economic categories. Thus, for example, he gives a new meaning to the psychological doctrine of feelings, in order to save and securely ground the economic doctrine of diminishing utility. He makes them obey the Weber-Fechner law (pp. 233 to 235)—an undertaking not as yet accomplished by psychologists.

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[1] Cf. my article, Psychology in Economic Theory, to appear in the Journal of Political Economy.

The value of the book to economists must be determined—we presume—by them alone. Whatever their judgments may be, the first two-thirds of the essay is helpful to the student of social psychology as a review of the present confusion in the field of instincts. It might constitute a useful review of one phase of "instinct-psychology" for the graduate student who is desirous of preparing for his master's examination.

A. J. Snow,
Northwestern University.

Charles Conant Josey. *The Social Philosophy of Instincts*. Scribner's Sons, New York, 1922. Pp. 274.

The task that Professor Josey sets himself in this expansion of his doctoral dissertation is to throw some doubt on the reality of instinct as forces, a matter concerning which there is so much disagreement at this time. To accomplish the above task he gives the reader a remarkably clear explanation of the theory of instincts as forces of action and that this misconceived theory has a basis in reality the author of the essay does not dispute; in fact, he tries to discover this basis. "What better explanation can be advanced than to regard [the wonderfully adaptive behavior of organism, the sublimity of man's moral ideas, his clear vision of right and wrong, etc.] as due to *instincts*, or the accumulated wisdom of the species? In brief, what other explanation can be given in a world of cause and effect? Thus, the old superstitions founded on belief in metempsychosis and theological speculations give place to 'scientific' explanations based on the assumption of ancestral memories, or of wisdom and habits acquired by the species. To discuss the transition from superstition to 'science' is the first task of this treatise. The connecting link is the feeling that certain activities cannot be adequately accounted for in terms of the individual's experience and capacities. To supplement explanations in these terms, various conceptions are invoked. However different these conceptions may be, all of them have this in common: instead of solving the problems connected with behavior, they transfer them to another realm. In one case the problems are transferred to a psychology of ancestral ghosts or spirits; in another, they are transferred to the realm of Divine psychology; and in another, they are transferred to the psychology of the species. Yet in no case have we reason to suppose that the new fields are more available for research than the field presented by the individual acting here and now in our very presence. The study of the similarities found in the belief in metempsychosis and in instinct will serve also to show the sources of the powerful sanction of instinct" (pp. 22 and 23).

The criticism of the use of instinct as a sanction is the second task of the author. Here he finds "that interpretations of behavior in terms of forces are not only unnecessary and unilluminating, but actually prevent a factual study of behavior on account of the mass of psychological impedimenta, whose origin furnishes such a fruitful cause for controversy. Behavior . . . . should be interpreted not in terms of forces but in terms of the relations the organism sustains to its environment. By so doing one gets close to the facts which should enable him to correlate the activities of an organism with the variable factors which determine that the organism shall act as it does rather than in some other way" (pp. 23 and 24).

The third task that Professor Josey assigns to himself is to giving a "brief statement of the point of view of the essay and . . . . [the] pointing out certain differences which should follow in social practices when the behavior of the individual is interpreted in terms of the give-and-take relations he sustains to his environment, rather than in terms of hidden forces that are released by a multitude of stimuli and that express themselves in a variety of responses" (p. 24).

To illustrate Professor Josey's point of view it may be well to give a number of his own examples, such as the following: "it has been found that passenger-pigeons ordinarily will not mate with ring-doves. Yet, if they are hatched by ring-doves, they will not only mate with ring-doves but will actually refuse to mate with pigeons. This difference in behavior cannot be regarded as due to innate differences between the pigeons that mate with pigeons and those that mate with ring-doves. The difference is clearly due to differences in their early experiences, or their psychological development. This truth may be further illustrated by a consideration of pigeons with reference to sex preferences. For instance, if male pigeons are raised with males only, they, at mating season, are attracted to the males, but they treat them as females. On the other hand, if a male is raised with females only, he will act toward the males at mating season as the females do. Here it is again obvious that innate tendencies throw little light on the behavior; for in these cases we have behavior that is quite different, and yet the innate characters are presumably the same. Nor is light thrown on this behavior by regarding it as due to the passing away of certain transient instincts and to the awakening of others. Such speculations are quite unnecessary, for the behavior is more intelligibly accounted for in terms of the known and observed experiences of the agents. Sex aberrations in man may be used to illustrate the same truth. The impressive fact that comes out in a study of the psychology of sex is that normal sex behavior and interest are as much a product of normal and favorable conditions as abnormal and objectionable sex behavior is the result of unfortunate and abnormal sex experiences" (pp. 211 and 212).

Again, Professor Josey asks: "Is work the result of an instinct? That work is the result of conditions under which one lives seems to be recognized by Veblen himself in accounting for the universality of work at the dawn of human society. Change the conditions and one's attitude toward work undergoes a profound change. And instinct that is thus dependent for its expression on environmental conditions might well surrender its rôle as a motivator of activity; for the real motivator seems to be the total situation. That there is no need for an instinct of this sort becomes apparent through the consideration that work is always for the purpose of realizing some desire. We work, not because we have an instinct to work, but because we live in a world that makes it necessary that we have purposes and make provision for the future. Place man in a world in which all his future wants are provided for, there would be little work. We work because we live in a world in which work is necessary. The attractiveness of the Garden of Eden lies to a great extent in the fact that there men lived in a world in which work was unnecessary. Men in such a world would not work if the habits of those living in the tropics may be taken as sufficient evidence of what men in general would do in a world freed of the necessity of work. In the tropics little work is necessary and little work is done. There is no necessity of confining our illustrations to remote tribes. Great numbers of men in our own communities, provided with ample means, do no work. This class of men is not confined to the wealthy. Men of moderate means prefer to live on a small income rather than work for a larger one. Even laborers show this disposition. It is a common complaint in the South that high wages for cotton-picking make it difficult to get the cotton picked, as this only affords the pickers a living for less work, and consequently they do less work. On the other hand, we have all observed many men of wealth hard at work. Are we to follow Veblen in regarding these men as cases of sporadic reversion to the primitive instinct? They can be much better accounted for in terms of the ideals and purposes that have been impressed on these individuals than in terms of a biological difference between them and other men of wealth. We may safely assume then that men work, not because of an innate urge to work, but because of necessity and of the ideals impressed on them. The necessities of men differ. What is a necessity to one man is gladly dispensed with by another, if he can save himself from working. On the other hand, men who have no need to work and yet do work are animated by high and big purposes. They are ambitious to become great. It is for this reason that we find men in all classes hard at work. But work in no case should be regarded as due to an innate urge to work. When it is not due to necessity it is due rather to the dynamic character of purposes, ideals, and ambitions which have arisen in the individual as a result of his contacts and training" (pp. 164 to 166).

Finally Professor Josey states the following conclusions—which we believe are warranted from the material presented in the essay—that "the conception of instincts and emotions as innate characters, which determine our activities, is a very arbitrary assumption and one which goes counter to all the facts of development and adaptation we have considered. For it has been shown that the development and activity of an organism are determined by its initial structure, its experience, physiological conditions, and the presented stimuli. There is no room in such explanations for instincts regarded as determiners of activity. Instincts are not to be regarded as determiners of behavior but simply as names for characterizing certain activities . . . ." (p. 223).

"Nor is there a store of energy or impulses in the organism seeking to find expression in various outlets. The energy or impulse comes into existence when there is a certain situation in the same way that iron glows when treated in a certain way, or that a certain explosive force comes into existence when the various elements composing nitroglycerine are combined in a certain way and then set off. It would be a mistake to regard the explosive force as existing in the nitrogen carbon, and other elements. It exists only in the combination, and then only when the combination is treated in a certain way. . . . . It is because we feel a necessity to explain 'in virtue of what' an organism acts that we posit within the organism various innate forces, somewhere acquired, which by various manipulations are supposed to account for the behavior as we observe it. This need would disappear if we would only recognize that activity does not need to be accounted for. Activity is the starting-point for science. All we hope to know is what determines the particular acts or forms of activity. In seeking to learn these it would be well to clear our minds of all expectation of greatly increasing our knowledge of the determinants of behavior by hypostasizing certain activities or responses into forces that are used as explanations of the various activities" (pp. 224 to 237).

The influence of the Columbia School of Philosophy upon Professor Josey's point of view is only too obvious—that the above conclusions are dealt with in a measure by Professor Dewey in his *Human Nature and Conduct* is known to Professor Josey—but that Doctor Josey's wish, as stated in his preface, is being fulfilled there is no doubt. His able presentation of his subject matter, no doubt, will help to "introduce a more critical attitude regarding the dogmatic claims of evolutionists."

Professor Josey's last paragraph, although not new in principle, is worth restating at this time because of its bearing upon our general theory of social progress: "Since our behavior, desires, and impulses are the results of our activities, determined by the give-and-take relations of the individual to his environment, the duty and rôle of intelligence become clear. It is not to sit by in idle leisure in the hope that there is within us a guide fully competent and willing to direct and guide us. Its duty is rather to take an active part in the ordering of our behavior by varying the conditions that confront the individual so that the responses, impulses, and sentiments that are preferred shall dominate the characters of men."

A. J. SNOW,
Northwestern University.

JUNE E. DOWNEY, PH. D. *The Will-Temperament and Its Testing.* World Book Co., Yonkers, New York.

The attack on the problem of analyzing and measuring traits of personality has begun. Each year sees an increasing number of recognized psychologists applying the scientific method to what has heretofore been a profitable field for quackery.

At the present time the most unique and promising attempt to measure non-intellectual factors in personality is by all odds, Downey's Will-Temperament Test. Her book, *The Will-Temperament and Its Testing*, is an explanation of the genesis of the test, its use, and its significance. The test is the result of rare originality combined with years of painstaking experimentation.

Type responses of a contrasting nature were first recognized in experiments in muscle reading. From this beginning Dr. Downey has developed a series of twelve tests, which she combines into three groups. These are speed-tests, tests for aggressiveness, and tests for carefulness and persistence. There are obviously other important traits of personality untouched by these tests, such as honesty, for example. But temperament as used by Dr. Downey is one's characteristic activity determined by two factors, the amount of nervous energy at one's disposal, and one's tendency for immediate or inhibited discharge.

Handwriting is the medium of motor expression used in most of the tests, because practically every one knows how to write and this procedure leaves a permanent record of the muscular movement. Any other form of motor expression if feasible might be used according to Dr. Downey for the psycho-physical organism in a unit which expresses itself characteristically in all its various functions.

More significant than the standings in the individual tests is the will-temperament pattern which is indicated by emphasis on one or two of the three groups. Thus an individual who is low on the speed group and high on the accuracy group will do better school work than his score on the intelligence test would indicate. This supplementing of the much used intelligence tests is an important function of the will-temperament series. It explains many inequalities between achievement and capacity.

A reliable test of temperament would, of course, be immediately useful in many ways. One chapter describes the applications which have already been made of the Downey test in school work, court work, medicine and business.

Dr. Downey's critics have attacked the apparently uncritical way in which she has labeled the tests. "Flexibility," "Speed of Decision" are not specifically defined traits, but are used as names of tests. Dr. Downey states quite candidly the weak points of the tests but she advances three types of proof to show that they measure, to a degree at least, the traits named. These proofs are the identification of temperament patterns (called Will-profiles) under standard directions, the correlation of test results with personal estimates, and the relation of test results to recognized symptoms of psychopathic subjects.

One criticism of the test in the opinion of the writer is that a trained examiner is required. One is needed who not merely knows the test technique but one who is familiar with the background and the development of the test. This limits its use. In some of the tests a very real conflict of personalities occurs. This makes the personality of the examiner more of a disturbing factor than is the case in most tests.

The book is written in a delightful style, which is occasionally interrupted with citations of correlation coefficients. These mean little, lacking statements of the number of cases on which they are based.

A little humor in a scientific book is as rare as it is refreshing. The description of a group of people taking the tapping test is very pleasing

The reader finds himself classifying his own traits of temperament as he reads. In fact, one cannot go through the book without being stimulated to observe people more closely.

Dr. Downey has made a specific contribution to one of the biggest problems in psychology and in life.

Jay Ream,
Assistant Superintendent of Agencies,
Mutual Benefit Life Insurance Company
Newark, N. J.

C. A. Henderson. *Personal and Business Efficiency.* George H. Doran, New York, 1923. Pp. viii + 308.

It is possible to review this book from the point of view of the psychologist or of the business man seeking inspiration. The book is primarily intended to appeal to the embryonic and full-fledged business man and from their point of view may be considered very stimulating. But since the author is a professor of psychology and since this is a psychological journal I feel justified in criticizing this book on psychological grounds.

Convinced that "in the last resort there is no other way to business efficiency than through personal efficiency," the author takes up these two types of efficiency side by side with special emphasis on the latter as being the more important since the former depends upon it. The book is written for the general public and for students for whose guidance the author has furnished outlines, notes and exercises at the end of each chapter. It may thus serve as a text for such a course in business schools. Since the fundamental appeal is to the general public the style and treatment is popular.

The first three chapters are introductory and deal with the increasing need and the ends of personal and business efficiency, the nature and training of our resources for efficiency. In the next chapter the author deals with the will and says with dogmatic assurance that "the first characteristic of the will is that it is free, possessing from itself the power to man the switch and alter the direction of our train of associated ideas. The second characteristic is that in doing this it exhibits a quality of reason or wisdom." Such a conception of will seems to be rather antiquated. The entire book is a curious mixture of a little psychology and much questionable material. Thus on page 81 the author speaks of the "instinct of caution" and in the next line "the instinct of rage" and on page 170 the commercial instinct, but on page 116 he returns for a while to psychology in presenting Dewey's analysis of the thought process. The book is run through with the kind of inspiration usually fed to business men: as "concentration, attention, therefore, increased and made ever more continuous, is the one and only way to will power" (p. 82), and on the same page "the wise man repeatedly says to himself, 'I can,' whereupon the impossible becomes possible;" thus giving the book a flavor of Couéism. At the end of the chapter on The Master Builder we find among the notes quotations from such varied sources as James, Royce, Münsterberg, Payot, *Power of Will* by Haddock, and *Keys to Success* by B. C. Forbes.

The discussion of memory, imagination, thought and emotion is in much closer accord with the views prevalent among scientific psychologists than that of the preceding chapter on the will and that of the following on Putting Originality into Our Work. In this chapter on originality the author quotes from Coué and others to bolster up the argument on the wonder working powers of *faith*. In the next three chapters the author gives a popular account of the formation of judgments, sound habits, and the development of physical fitness. The last part of the book deals with the paths of efficiency and includes discussions on the conduct of the day's work, coöperation through salesmanship, and two final chapters dealing with the personality, closing with a discussion of religion as necessary to a well-balanced personality.

It is to be expected that a book attempting to discuss in a popular style such topics as the will about which there is so much controversy in psychology, mental efficiency and personality, subjects on which our scientific knowledge is so meager, will be necessarily vague and open to question. This book is no exception. It contains few facts but is brimful with authority, some good and others open to question on scientific grounds, the whole of undoubted popular appeal, however.

MAX MEENES,
Princeton University.

ARLAND D. WEEKS. *The Control of the Social Mind.* With introduction by Joseph Jastrow. D. Appleton & Co., New York, 1923. Pp. xviii + 263.

Speaking of social control through psychology, the author expresses the purpose of the book when he states at the end of the first chapter that "Psychology can indicate the mechanisms and resources; a social-moral conscience must set the course to be followed." In his own words his "purpose is to consider aspects of mind that have special significance for further social development and better ways of getting on together.". By redirecting man's mind it is possible to construct a far better social environment than our present one. The author opposes social inflexibility and recommends the adoption of experimental attitude toward social problems. In Chapters 4 and 5 he shows that social progress is essentially a matter of breaking habit, and points out the tendency to cling to a concept "long after succeeding events have sucked away its substance" and urges that we define social terms with greater exactness.

In an illuminating chapter on The Psychology of Defense the author indicates the progressive refinement of defense methods in human social evolution. Here also is an analysis of the influence of propaganda. The chapter following deals with the necessity and basis for coöperation. In discussing the need for an enlightened citizenship active in public affairs as the keystone of democracy, the author shows how little developed is "the art of reporting on public business," how little opportunity the citizen has to instruct his representative and how "civic lethargy results in part from lack of knowledge, which in turn is related to lack of means of effective communication touching public business" (p. 99).

The second part of the book takes up the Social Mind at Closer Range and opens with chapters on instinctive tendency and expression of motives. As instinctive tendencies to behavior the writer discusses instinctive partisanship and the instinct of adventure which would not ordinarily be included in a more rigid classification of instincts, the tendency to physical activity, mental activity, instinct of curiosity with which he appears to couple what he calls the searching instinct, then takes up the fighting tendency, rivalry, display, instinct of fear which is more generally assumed to be an emotion, and the instinct of play which is in reality not a distinct instinct but a combination of other tendencies. Although it is hard to find a definition of instinct which will include all expressions the author discusses under that name, yet his treatment is very lucid and informing for the layman. The discussion of social memory is of special value for the intelligent citizen lacking in psychological knowledge. In order that we break loose from evil precedent the writer recommends that the historical past be neglected. Then follows a chapter on the art of accuracy which is essentially a plea for careful observation of social phenomena. The next chapter deals with suggestion and group behavior. The author finishes with a discussion of fatigue and urges the conservation of individual powers in order that there may be a surplus of energy to take up more effectively the individual's civic responsibilities.

This book is a valuable contribution to the *Conduct of Mind Series*. While some of the contents will not bear up too well under psychological scrutiny, it is nevertheless an able survey for the layman of the available psychological material underlying the control of social forces.

MAX MEENES,
Princeton University.

D. STARCH. *Principles of Advertising*. A. W. Shaw Co., New York. Pp. vii + 998.

The author has undertaken to bring together in one treatise the available material, from empirical and practical business sources, on the various questions which may at one time or another trouble the advertiser. The book is divided into six parts the first of which is introductory and includes an account of the history and development of advertising with its place in business; the second attempts an analysis of markets and methods of determining the individuals in the community to whom a given commodity may be sold; the third part deals with experimental and statistical analyses of the various possible appeals with methods of determining their comparative merits based on analysis of human nature, with chapters on sex and group differences; the fourth deals with methods of presenting appeals including a chapter on the use of suggestion and argument in advertising, one on the practical ethics of truth in advertising and chapters dealing with headlines, illustrations, size, color, layout, use of trade-marks and cartons and labels; the fifth deals with advertising mediums; and the sixth with various special types of advertising including national, retail, foreign and financial. The book is very comprehensive and is of value in that it emphasizes the use of experimental and statistical methods in advertising.

Early in the book the author gives a concise account of the development of advertising from the earliest known records to the present stage of constant increase in the use of research methods. He points out statistically the remarkable growth in number and circulation of periodicals concurrent with the increasingly proportionate use of advertising space. Today there is much competition in advertising and so vast a sum of money is spent annually in this enterprise that it is obviously of great importance to develop experimentally methods to make advertising more effective and so most economical, thus helping to eliminate the waste accompanying unscientific advertising. Perhaps one of the important forms of waste which the author neglects to mention is that due to competition among advertisers which results in each firm attempting successively to outdo its competitors in volume of advertising. The book places a healthy emphasis on quality rather than on wasteful quantity and this can come about only through the application of scientific methods. On page 57 the author points out that the cost of advertising does not add to the price of the article but it would be of some interest to show in this connection that advertising is sometimes effective in enabling a manufacturer to sell an article at large profit by creating enormous demand for the article as in the case of the Gillette razor or the cranberry campaign which resulted in "bringing the record price of $22 a barrel" which the author cites on page 68 in another connection. In other instances the author shows that advertising is influential in reducing the price and improving the quality of a commodity. Probably the price depends in part on the attitude of the advertiser toward society.

The author points out the necessity of securing facts pertaining to the distribution of population and then goes on to discuss the use of the questionnaire method in gathering preliminary data for the advertiser. Much useful information can readily be secured by careful use of a judiciously prepared questionnaire and so the author recommends its extensive use to determine such basic factors as the preference of mediums of the customer, types of appeal, habits of buying, brand preferences, affective values of trade marks, various types of headlines, pictures, discovering uses of a product, etc. A number of sample investigations are included to illustrate the value and methods of application of the questionnaire. When he attempts an analysis of human nature the author presents a list of instincts which can hardly be justified on psychological grounds but which may serve as a basis for the advertiser. The relative strength of these instinctive incentives to action was determined by a study made with a large number of individuals using the rank method. The rank method is also used to determine the relative value of a number of possible selling arguments.

The discussion of suggestive advertising is very illuminating and much interesting psychological data is cited to show the importance of ideomotor action and suggestion. Much experimental data is presented to show the effectiveness of suggestive advertising the importance of which is demonstrated by its steadily increasing use. The following chapter presents a scientific account of the value and methods of use of argument in advertising, especially to put across a new product to the buying public. The discussion of truth in advertising is of great interest and the author points out that there is an unmistakable tendency to eradicate untruthful and misleading advertising, but greater emphasis might perhaps be laid on the fact that the most effective argument for truth in advertising is to prove conclusively that it pays in actual dollars and cents to the advertiser.

In a series of important chapters rich in statistical and experimental material, we find much good data on the use and most effective forms of headlines, color, layout, size, form and illustrations of advertisements. In some of the experimental material it is virtually impossible to account for all the selection factors when one aspect of a complete advertisement is tested for, as in studying the effect of size, but the author ruled out selection in part by making the test advertisements as nearly similar as possible varying only the quality tested for. So instead of using a series of ads varying in size it would have been more indicative to use ads as nearly alike as possible except in the matter of size. The author goes on further to present results of psychological studies on the affective value of color and form and of position. The last section of the book is devoted to a discussion of special fields of advertising with a treatment of national, retail, foreign and financial problems.

The book was apparently put together in great haste, making the author's meaning in parts rather difficult to get at; thus on page 918 the sequence of lines is so unusual as to make the meaning very difficult of understanding. In table 102, page 923, the columns "customer readers basement" and "customer readers upstairs" are interchanged, thus making the table read the exact opposite of what the author tries to convey in the text. Such work may be excusable in a daily newspaper which must be put together in a hurry, but one hardly expects to meet with it in a careful compendium. The book contains a vast amount of material of value to advertisers of all description; let us hope that the author will not mar the companion volume on advertising problems which is now underway by any such haste as marks this book.

Max Meenes,
Princeton University.

M. V. O'Shea. *Tobacco and Mental Efficiency.* Macmillan Co., New York, 1923. 258 pp.

In coöperation with the Committee to Study the Tobacco Problem Professor O'Shea, of the University of Wisconsin, has prepared a very comprehensive and impartial summary of available data and opinions with regard to the effects of the use of tobacco upon mental characteristics and scholarship, and has combined with this compilation the results of some extended laboratory experiments of his own. The book is made up of three parts. Part I presents data derived from observation, introspection, and biography; Part II summarizes data chiefly statistical derived from school and college records; Part III presents Professor O'Shea's laboratory findings. An extended bibliography is appended.

The conclusions of the study are summarized separately for mature and for immature persons. Professor O'Shea concludes from the laboratory tests that, for mature persons "the results show that tobacco tends to retard and to disturb intellectual processes but not in the marked degree in the case of the particular functions which were investigated." As to the effects upon immature persons, the data and opinions collected by Professor O'Shea point quite conclusively to the damaging effects upon character and scholarship of the early use of tobacco.

The laboratory and statistical technique employed by Professor O'Shea commend themselves in their impartiality and care. Particular pains were taken in the laboratory tests to eliminate extraneous factors such as suggestion. The subjects experimented upon were blindfolded and were allowed to smoke, in the different sessions, two different pipes, one of which contained tobacco and the other of which was cleverly contrived to give the sensations of smoking without the use of tobacco in the pipe. The conclusions of the experiments were based upon differences in various tests and measurements when the subject was actually smoking and when the control pipe was used.

From a statistical standpoint, the care with which Professor O'Shea endeavored to ascertain the reliability of the differences between the measurements obtained deserves special commendation. One or two queries arise, however, in the mind of the reader. In two or three instances, a reduction of over 100 per cent in a given measure is shown For instance, on page 197, table D indicates that subject number 14 lost 182 per cent in steadiness of muscular control when smoking tobacco The statement of losses of over 100 per cent must mean that the scales used were not adjusted so as to have the zero point at absolute zero. For many of the characteristics no absolute zero exists. The reduction of the observed differences to the percentage basis is therefore decidedly misleading. In order to have the results comparable, it would be desirable to show the effects of tobacco in terms of multiples of the standard deviations of the measures used. To say that tobacco increases the pulse rate by an average of 6 per cent and increases muscular fatigue 6 per cent, gives a probably illusory sense of the equivalence of the effect in these two cases; whereas, if the statement were made that tobacco increases the pulse beat by one standard deviation and muscular fatigue by one standard deviation, the comparison would be valid.

In the Summary Table on page 222, the general average effect on muscular fatigue is given as -5.76, whereas on page 109, the same item is given as $+5.76$. The reversal of sign in the summary table means an unfortunate reversal in conclusion on an important aspect of the investigation.

It seems clear that Professor O'Shea's book becomes the authoritative summary statement in this field. No one who is interested in the effects of narcotics upon mental processes or upon character can afford to ignore it.

HORNELL HART,
University of Iowa.

H. E. BUCHHOLZ. *Of What Use Are Common People? A study in democracy.* Warwick & York, Baltimore, 1923. 251 p.

The animus of Mr. Buchholz' may be suggested by a quotation from his preface:

"A group of psychologists devised a series of mental tests to be used on the men drafted for military service with the view to placing each individual in that branch of service for which he seemed best fitted and also for selecting draftees of supposed mental superiority who might profitably be schooled as officers. How far these tests served their intended purpose has apparently been ignored as a matter of slight consequence, while the data produced by the testings have been accepted as altogether reliable and are being freely interpreted, by scientists and laymen, to indicate that an amazingly large percentage of the entire population is incapable of mental development past that of a twelve year old child. . . . .

"No matter where the contemporary reader turns—to newspapers, to magazines, or to books—he finds this kind of disturbing analysis of the American people coupled with the suggestion, veiled or open, that democracy as democracy has heretofore been understood is a dream fast turning into a nightmare."

The motivation of the book appears to be a strong emotional reaction against the emphasis upon individual differences which has grown out of the mental test movement and in particular against the proposal to adjust education in accordance with mental capacity, and the proposal to combat the excessive fecundity of the less intelligent classes by the spread of the knowledge of birth control. No organized data and no scientific criticism are used in the course of the somewhat rambling argument.

HORNELL HART,
University of Iowa.

NEW BOOKS AND PAMPHLETS RECEIVED[1]

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

Allport, Floyd H. *Social Psychology.* Houghton Mifflin Co., New York. 451 pp.

Alexander, F. Matthias. *Constructive Conscious Control of the Individual.* E. P. Dutton & Co., New York City. 317 pp.

Barry, F. R. *Christianity and Psychology.* George H. Doran Co., New York. 195 pp.

Bennett, Henry Eastman. *Psychology and Self-Development.* Ginn & Co., New York. 296 pp.

Bovet, Pierre. *The Fighting Instinct.* Dodd, Mead & Co., New York. 252 pp. Price $4.00.

Buchholz, H. E. *Of What Use Are the Common People?* Warwick & York, Baltimore, Md. 251 pp. Price $2.00.

Educacion, Revista Mensual. Vol. II, No. 5. Apartado Postal, 1954, Mexico, D. F.

Cooley, Charles Horton. *Social Process.* Charles Scribner's Sons, New York City. 430 pp.

Downey, June E. *Will-Temperament and Its Testing.* World Book Co., Yonkers, New York. 339 pp.

Foster, William S. *Experiments in Psychology.* Henry Holt & Co., New York. 309 pp.

Franz, Shepherd Ivory. *Nervous and Mental Re-Education.* Macmillan Co., New York. 225 pp.

Freeman, Frank N., and Dougherty, Mary L. *How to Teach Handwriting.* Houghton Mifflin Co., New York. 305 pp. Price $1.80.

Fuller, Raymond G. *Child Labor and The Constitution.* Crowell Publishing Company.

Folmer, Anth., and Gerritsz, J. *Tijdschrift Van Den Nederlandschen Werkloosheilds-Raad.* Vols. 10 and 11, 1923. Bureau: Kloveniersburgwal 70, Amsterdam.

Gesell, Arnold. *The Pre-School Child.* Houghton Mifflin Co., New York. 264 pp.

Hinkle, Beatrice M. *The Re-Creating of the Individual.* Harcourt, Brace & Co., New York. 464 pp.

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[1] Mention here does not preclude further comment.

Hollingworth, H. L., and Poffenberger, A. T. *Applied Psychology.* D. Appleton Co., New York. 431 pp. Price $2.50.

May, James V. *Mental Diseases.* Richard G. Badger, Boston, Mass. 544 pp. Price $5.00.

Monroe, Walter S. *Present Status of Written Examinations and Suggestions for Their Improvement.* University of Illinois Bulletin, Urbana, Ill. 77 pp.

O'Shea, M. V. *Tobacco and Mental Efficiency.* Macmillan Co., New York. 258 pp.

Prescott, Daniel Alfred. *Determination of Anatomical Age in School Children and Its Relation to Mental Development.* Harvard Monographs in Education, July, 1923. Harvard University, Cambridge, Mass. 50 pp.

Reymert, Martin L. *Development of a Verbal Concept of Relationship in Early Childhood.* Scandinavian Scientific Press, Kristiania, Norway. 83 pp.

Robinson, Edward S., and Robinson, Florence Richardson. *Readings in General Psychology.* University of Chicago Press. 676 pp. Price $4.50.

Ruch, G. M., and Knight, F. B. *Syllabus for a First Course in Educational Psychology.* Iowa Supply Company, Iowa City, Iowa. Price $1.00.

Scott, Walter Dill, and Clothier, Robert C. *Personnel Management.* A. W. Shaw Co., New York. 643 pp.

Snow, A. J. *Problems in Psychology.* Henry Holt & Co., New York. 115 pp.

Valdizan, Hermilio, and Delgado, Honorio F. *Revista de Psiquiatria y Disciplinas Conexas.* Vol. IV, No. 4. Lima, Peru.

Wells, Frederic Lyman. *Pleasure and Behavior.* D. Appleton Co. New York. 274 pp. Price $2.50.

PUBLICATIONS ISSUED BY THE DEPARTMENT OF THE INTERIOR, BUREAU OF EDUCATION, WASHINGTON, D. C.

Agricultural Education. George A. Works. Bulletin No. 19, 1923. 21 pp.

Appreciation of Pictures. Bertha Y. Hebb. City School Leaflet No. 13. October, 1923. 15 pp.

Biennial Survey of Public School Finance in the United States, 1920–1922. Fletcher Harper Swift. Bulletin No. 47, 1923. 34 pp.

Commercial Education—School Opportunities and Business Needs. Glen Levin Swiggett. Commercial Education Leaflet No. 7, September, 1923. 10 pp.

Consolidation of Schools and Transportation of Pupils. J. F. Abel. Bulletin No. 41, 1923. 135 pp.

Consolidation of Schools and Transportation of Pupils in Lafayette Parish, La. Rural School Leaflet No. 19. 10 pp.

Current Educational Publications. Bulletin No. 54, 1923. 44 pp.

Dramatics for Health Teaching. Harriet Wedgwood. Health Education No. 13. 16 pp.

Educational Research. Bird T. Baldwin. Bulletin No. 42, 1923. 76 pp.

Games and Other Devices for Improving Pupils' English. W. W. Charters and Harry G. Paul. Bulletin No. 43, 1923. 99 pp.

Growing Healthy Children. Mrs. Ina J. N. Perkins. School Health Studies No. 4, 1923. 35 pp.

Junior High Schools in Cities Having a Population of 2,500 and Over. Bertha Y. Hebb. City School Leaflet No. 12, September, 1923. 6 pp.

Kindergarten and Health. Arnold Gesell and Julia Wade Abbot. Health Education No. 14, 1923. 38 pp.

Organization of Research Bureaus in City School Systems. Elise H. Martens. City School Leaflet No. 14, January, 1924. 15 pp.

Outline of Educational Systems and School Conditions in Latin America. George W. A. Luckey. Bulletin No. 44, 1923. 111 pp.

References on Secondary Education in the United States. Library Leaflet No. 22, June, 1923. 10 pp.

Salaries of Elementary, Junior High, and High School Teachers in Certain Cities. Bertha Y. Hebb. City School Leaflet No. 15, January, 1924. 16 pp.

Schools and Classes for the Blind, 1921–1922. Frank M. Phillips. Bulletin No. 51, 1923. 12 pp.

Status of Certain Social Studies in High Schools. Harry H. Moore. Bulletin No. 45, 1922. 21 pp.

Taxpaying as a Lesson in Citizenship. Macy Campbell. Rural School Leaflet No. 21, October, 1923. 8 pp.

Work of the Bureau of Education for the Natives of Alaska. William Hamilton. Bulletin No. 46, 1923. 4 pp.

Training of Teachers for Platoon Schools. W. J. Bankes. City School Leaflet No. 11. 5 pp.

EXPERIMENTAL STUDIES IN VOCAL EXPRESSION[1]

ANDREW THOMAS WEAVER

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II. THE PREDICTION OF TALENT FOR VOCAL EXPRESSION IN READING

The extension of the principles and technique of vocational psychology into the field of vocal expression is a new venture. Indeed, the use of psychological tests for determining artistic capacity and aptitude in any line is a most recent phase of the movement for vocational guidance. Seashore, in his tests of musical talent, blazed the trail. The objective in the experimentation herewith set forth was the assembling and weighting of a battery of tests which would give a significant coefficient of correlation with a criterion adequately representative of capacity for vocal-expression in reading.

Preliminary analysis of the problem

One fundamental consideration to be borne in mind constantly is that vocal expression can be measured by only one standard: viz., *its effect upon listeners.* Vocal expression is something to be perceived, something to be reacted to, and if we would appraise it, we must do so by measuring the reactions of listeners. In the field of aesthetics, "there is nothing good or bad but thinking makes it so." Woolbert[2] proceeded upon this fundamental assumption. By implication at least, he says that one measure of vocal effectiveness is the permanence of its impression upon the listener. In the present study it has been taken for granted that vocal expression which is adjudged to be good, bad, or indifferent by a representative group of listeners *is* what it is adjudged to be.

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[1] Continued from the March number.

[2] C. H. Woolbert, Effects of various modes of public reading. Journal of Applied Psychology, June–September, 1920.

There is need for a much more comprehensive experimental study than has yet been made of the reactions of listeners to different types of vocal expression. Of course it may be asserted that the degree of skill indicated in a given bit of vocal expression is to be determined by measuring the proficiency shown in the use of each of the four elements of vocal sound; viz., force, quality, time, and pitch, but this is merely to restate the problem by breaking it into four pieces. Gordon and Lyman say: "In vocal expression, thought must seek an outlet through voice which thus becomes an object of study. . . . . It follows then that in the elementary qualities and attributes of sound a basis may be found for the study of vocal expression." And again, "These natural ways of uttering thought or emotion through the voice are of four kinds: melodic, qualitative, temporal, quantitative."[3] This represents the traditional answer to the question: what is vocal expression?—traditional, at least since Dr. James Rush wrote his *Philosophy of the Human Voice,* now nearly a century ago.

That there is help in this analysis of vocal expression into its physical elements, no one will deny. Its limitation is that it usually fails to distinguish between the physical elements of sound and their psychological correlates. The reactions of the listener to each of these elements, and more particularly to the fusion of them—a fusion made up always of four variables—are but slightly understood.

We now come to the question: what are the factors involved in the production and control of the complex activity comprehended under the term *vocal expression*? Or, more simply stated, what, so far as vocal expression is concerned, makes an effective reader?

The reply of most writers on vocal expression would be substantially as follows: Skill or ability in vocal expression depends upon an adequate, present understanding and appreciation of the meaning of the language uttered—both as to ideas and feelings, thoughts, and emotions; trained vocal organs capable of revealing this understanding and appreciation to the listener; and a proper conception of the reader's relation to the listener. This statement may be true but it is inadequate and somewhat superficial.

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[3] H. Gordon and R. L. Lyman, Vocal Expression in Speech. Ginn and Co., 1911, p. 18.

Scripture analyzes vocal control into the following factors:

1. Reflex tonus
2. Force of movement
3. Accuracy of movement
4. Precision of movement
5. Accuracy of coördination
6. Quickness of response
7. Quickness of movement
8. Forms of sensory-motor control
9. Ideo-motor control
10. General voluntary control[4]

One can scarcely read this list without noting some of its obvious defects. Despite Scripture's rather labored attempts to differentiate these ten factors, it remains dubious whether 3, 4, and 5; also 6 and 7 are not essentially identical. However, the analysis is fundamental and, when understood, it proves highly suggestive.

Before giving a tentative analysis of vocal expression, it may perhaps be well to quote Seashore as to the principles and considerations which guided him in a similar undertaking. He says,

> In making an inventory of the musical mind, we are guided by two coördinate bases of classification: first, the attributes of sound; and second, the generally recognized powers of the human mind. . . . . Our classification of items will, therefore, be a list of those traits of the human mind which are necessary for the apprehension and expression of the recognized attributes of sound. These are: the hearing of tones, the production of tones, the representation of tones in memory and imagination, musical thought, and musical feeling.[5]

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[4] E. W. Scripture, Elements of experimental phonetics. Yale University Press, 1902, p. 382.

[5] C. E. Seashore, The psychology of musical talent. Silver, Burdett, and Co., 1919, pp. 6 and 7.

It should be remembered that we have restricted the meaning of the term *vocal expression* to *vocal expression in interpretative reading*, and that we are here engaged in the attempt to analyze the talent or capacity for such vocal expression. It seems to me that the following factors must be significant in this composite ability, talent, or capacity:

1. General intelligence
2. Emotional responsiveness
3. Neuro-muscular coördination
    - *a*. Motility
    - *b*. Accuracy
4. Audition
    - *a*. Sense of pitch
    - *b*. Sense of force
    - *c*. Sense of time
    - *d*. Sense of consonance
    - *e*. Memory for tones
    - *f*. Sense of rhythm

It will be seen that, in respects which I have tried to make clear, I am indebted to both Scripture and Seashore for this analysis. It seems certain that any attempt to predict talent for vocal expression in interpretative reading will involve the use of tests which measure some or all of the factors suggested here.

The criterion

Nothing need be said here regarding the importance of the criterion in vocational and aptitude tests. It is patent that the worth of any test or battery of tests depends upon the character of the criterion with which they are correlated. Unless the criterion actually represents the ability or the aptitude, statistical computation is but vanity.

In order that those interested in this study may have complete evidence upon which to base a just opinion as to its validity, the criterion is described in considerable detail.

The subjects

The subjects were two hundred ten young men from ten different sections of the course in "The Elements of Public Speaking" at the University of Wisconsin. The young women in these sections were eliminated from the tests in order to avoid constant errors from sex differences. There were doubtless inequalities in speech training which could not be compensated for or avoided in the testing, but so far as school training in vocal expression was concerned there were no marked differences. Training in vocal expression is a less controllable variable than training in most other school subjects.

The material read interpretatively

Austin Dobson's poem, "Tu Quoque" which was used in the experiments described in the former paper[6] was read by each of the subjects. Two days prior to the reading, the experimenter gave each subject a mimeographed copy of this selection and asked that careful preparation be made for the vocal interpretation of the material.

Judging

As each subject read the assigned selection he was judged by every other student in his group. Thus, if there were 25 subjects in a given group, there were 24 judgments on each reading.

Each member of each group was given a ballot on which to record his judgment of the vocal expression of the several readers. At the top of each ballot were the following instructions:

> You are to give each reader a percentage grade on *vocal expressiveness*. If two readers seem *absolutely* equal to you, give them identical percentages. Try, however, to apply the same standard of *vocal expressiveness* to all and to make as fine distinctions as possible, using

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[6] Andrew Thomas Weaver, Experimental studies in vocal expression. Journal of Applied Psychology, March, 1924.

fractional percentages if necessary. After you have assigned percentage grades to all readers, excluding yourself, proceed to rank them from best to worst on the basis of the percentages.

The experimenter made sure in each case that the instructions were thoroughly understood.

All was now in readiness for the series of readings. As the experimenter called off the names of the individuals within the group, they were set down on the ballots and the readers proceeded to the rear of the room where a reading stand had been placed. The members of the group had been instructed not to turn their heads so as to see the reader during the reading. Thus the influence of the visible symbols of speech—facial expression, posture, movement, and gesture—was eliminated from the judgment. Some visual memory images of the readers' previous appearances before the class may have been reinstated by the auditory stimulation, but there was no way of eliminating this possibility in a group more or less acquainted with each other. In any event, if this factor influenced the result, it must have operated to attenuate the correlation between the criterion and the tests rather than to increase it.

Compounding the judgments

When all of the ballots had been properly marked they were collected and the ranks were combined into a composite group-ranking. The ranks assigned to each reader were added together and the readers were re-ranked on the basis of the sums thus obtained; the first rank being given to the reader with the smallest total of ranks; second, to the next larger, and so on down to the lowest rank. Rank 25 in a group of that number was of course assigned to the reader with the highest total of ranks.

There were several reasons for combining the ranks instead of the percentages; the principal one being the disparity of the scales used by the different judges. It was felt that individual judges handle percentage grades so differently that there would be greater definiteness of meaning, and more of common value, in ranks than in percentages. Then too, it seemed difficult if not impossible to get a sufficient spread in the percentage grades. Most students, like most teachers, always think of percentages in terms of school grades. They tend to fix the lower limit at 70 or 75 and the upper at 93 or 100. Perhaps if Professor West's studies in Judging[7] had been available when these experiments were under way, a satisfactory use of percentages might have been possible. It may well be added that the use of percentages involves perplexing questions when we attempt to combine different smaller groups into one large group as was necessary in this case.

The conversion of ranks into linear values

As explained in the preceding section, it was essential that some method of combining the smaller groups of subjects into one large group be found, if coefficients of correlation were to have any high degree of reliability. Since the groups were of unequal size, this problem seemed well nigh insoluble. Given unselected groups of unequal size, how was it to be determined just what the different *ranks* meant on a *common scale?*

Moreover, so long as our data is in terms of ranks we are restricted to the use of such coefficients of correlation as may be computed from ranked data: viz., Spearman's and its derivatives. There has been a good deal of question among statisticians as to the value of Spearman's coefficients and a growing insistence upon the use of a formula which takes into account the amount of differences in scores or grades as well as the order of ranks; viz., Pearson's products-moment method.

Moreover, it is held to be improper to use Spearman's coefficients in the regression equations which have been developed for weighting tests. Therefore since the criterion is so frequently a series of ranks, some method had to be worked out for converting ranks into measures available for use in Pearson's formula. Hull has made possible the solution of both problems confronting us at this point; viz., the combining of the several groups of subjects into one large group and the computation of Pearson's coefficients of correlation from ranked data.[8] These things are accomplished by a formula for converting ranks into linear values on a common scale. Hull says: "In translating the ranks into linear units, it is assumed that the ability in question is distributed according to the law of probability. . . . . Of course this is only approximately correct, but it is exact enough for practical purposes." The formula is:

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[7] R. W. West, Methods of computing contest scores. Quarterly Journal of Speech Education, October, 1919, pp. 319 to 333.

$$\text{Per cent} = \frac{100\ (c - 0.5)}{n}$$

where c = the ranks of a subject and n = the number of subjects in the group. "The per cent value is roughly a percentage expression of the distance in rank of a given subject from the extreme of the distribution ranked as no. 1." In this experiment, a 100 point scale was used. The ranks within each group were converted into these common linear values and then the groups were all put together assigning to each subject his score on the common 100 point scale. Hull gives a convenient table for the conversion of ranks into linear values.

The reliability of the criterion

As already stated, no argument is needed to prove that the validity and reliability of the measures constituting the criterion are of basic importance in the attempt to set up tests of any aptitude, skill, or capacity. Have we described a criterion which is essentially valid and reliable?

No ready and simple answer can be made to this vital query. I take it that no incontrovertible evidence can be adduced to establish the reliability of any criterion which is constituted out of the opinions and judgments of human beings when there is no objective reality with which the judgment can be compared. If we have a series of weights varying from one to another by a just perceptible increment we can tell how reliable the judgment of a given subject or group of subjects is by a comparison of the judgment with the objective reality—the series of weights. But obviously there is no such simple way of determining how accurately an individual or a group of individuals judge ability in vocal expression. Here we are dealing with an intangible *quantity of a different order. Vocal expression is an aesthetic* matter. It involves, if indeed it does not subsist in, the hearer's reaction and consequently excellence in it may be said to exist only in the hearer's opinion.

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[8] C. L. Hull, The computation of Pearson's r from ranked data. Journal of Applied Psychology, December, 1922.

Therefore, it would seem that the only possible test of our criterion must be: *does it accurately represent the opinion of hearers in general?* If it does, who shall gainsay its validity? The one available way of determining the quality of the composite judgment which is to represent talent for vocal expression is then the testing of this composite as to its consistency within itself.

The extent of agreement between the composite judgment of one-half of the group and the composite judgment of the other half, furnishes some basis for an opinion as to the degree of probability of agreement between the judgment of this whole group and that of another whole group. Accordingly group judgments were split in two. To illustrate: if there were 24 judges, the procedure was as follows:

1. The group of judges was divided into two groups of 12 each.
2. The ranks assigned to each subject by the twelve judges in each of the two sub-groups were added.
3. The subjects were re-ranked on each sub-group's total of ranks.
4. The ranks representing the two judgments on each subject were converted into linear values.
5. The coefficient of correlation between the two composites representing the two sub-group's judgments was computed. (Pearson's products-moments formula).

This computation was made for five representative groups with results as shown in the following table.

GROUP	NUMBER IN GROUP	r BETWEEN TWO SUB-GROUPS
1	24	+0.922
2	26	+0.912
3	26	+0.918
4	26	+0.932
5	26	+0.962

Does it not seem a warrantable assumption that, if the judgment of the smaller sub-groups agree to this extent, the judgment of another whole group on the data in question would agree even more closely with the judgment of this whole group?[9] And if so, have we not a reasonably reliable measure of vocal expression?

Some one may raise a question as to the expertness of the judges. It may possibly be urged that the criterion should be made up from the judgments of those *competent to express* an expert opinion as to what constitutes effective vocal expression. In answering this objection, we may well inquire as to whether an opinion which fails to conform to the judgment of a group of intelligent people can be accepted as expert and, if so, in what sense. I think that we may safely conclude that our criterion expresses with a reasonable degree of accuracy the typical judgment of intelligent persons as to what *vocal expression* in reading means.

The tests

In choosing the tests to be tried out in the attempt to build up a battery which should show significant correlations with our criterion, several general considerations had to be kept in mind. First, it was felt to be impracticable to use individual tests. It would have been impossible in any reasonable amount of time to test a number of subjects large enough to give any high degree of reliability to the correlations which might appear Then too, the usefulness of any battery of vocational or aptitude tests is directly dependent upon their availability for group use.

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[9] K. Gordon, A study of aesthetic judgments. Journal of Experimental Psychology, February, 1923.

The second principle which guided in the choice of tests was that of simplicity of technique in giving and scoring them. If tests are to be of any general usefulness they must be easy to give and easy to score, and they must have some range of adaptability with respect to the size of the groups which can be tested.

Finally, tests which seemed to offer the possibility of duplicating each other were avoided. The aim, as in all similar cases, was to assemble a battery of tests which should yield the highest possible correlations with the criterion and, at the same time, the lowest possible inter-correlations among themselves.

It was obviously impracticable to attempt tests of all the factors noted in our tentative analysis of vocal expression. Leaving out the second and third categories, *General Intelligence* and *Audition* remain and these were the peculiar objectives in the selection and use of the various tests which were tried out and from which the battery was finally assembled.

Two tests of general intelligence were essayed; viz., Army Alpha and Terman's revision of the Binet-Simon word list. After some preliminary experimentation, the former was abandoned in favor of the latter. Computations showed that the army test was not more closely related to the criterion and that it was substantially duplicated in the simpler vocabulary test. It was not difficult to foresee the negligible advantage which would result from the combination of these two tests between which the coefficient of correlation is in the neighborhood of +0.60.

For measuring the various phases of *audition* the most promising available tests were Seashore's group measures of musical talent. The phonograph records, (A7536, A7537, A7538, A7539, and A7540) issued by the Educational Department of the Columbia Graphophone Company make possible group measurements of *sense of pitch*, *sense of intensity*, *sense of time*, *sense of consonance*, and *tonal memory*.

Thus the tentative battery of tests was narrowed down to the vocabulary test and the five Seashore phonograph tests. All of these tests can be given expeditiously and effectively to groups of any size by any experimenter whether he is particularly skilled in the technique of psychological testing or not.

The instructions given in connection with the vocabulary test were as follows:

> You are to indicate your knowledge of the meaning of each word on the list by filling in the blank space after the word in one of three ways: with a definition of the word; with a synonym; or with a sentence, clause, or phrase in which the word is correctly and unambiguously used. If, from what you write, it is not reasonably certain that you know the meaning of a word, it will be marked wrong.

TABLE 1

	LOWEST	HIGHEST	MEAN	σ
Sense of pitch	40	93	76.53	10.91
Sense of intensity	61	99	89.18	5.74
Sense of time	53	93	79.14	6.22
Sense of consonance	44	90	69.17	4.43
Tonal memory	12	100	70.00	17.18
Vocabulary	42	96	75.07	9.73
Criterion	11	89	50.00	18.77

The subjects were given as much time as necessary to fill in the whole list. This usually required the greater part of one class period (fifty minutes). It was not thought necessary or helpful to check the time factor in the tests.

One examiner marked *all* of the vocabulary tests in order that there might be a minimum of variation in the standard of correctness applied. The score is the number of correct answers.

The Seashore tests were given in strict accordance with the directions in the manual of instructions furnished by the Columbia Company with the phonograph records. In the present experiment each of the five tests was given twice and the score assigned to each subject was the average of his two scores.

In table 1 are presented the lowest and highest scores, the means, and the standard deviations, in the five tests and the criterion.

Coefficients of correlation of the zero order

As in all similar cases, we must first compute all possible zero order coefficients of correlation between the criterion and the tests and among the tests themselves.

The formula used is an adaptation of the standard Pearson's products-moments formula:

$$r = \frac{M_{AB} - (M_A \times M_B)}{\sqrt{M_{A^2} - M_A^2}\,\sqrt{M_{B^2} - M_B^2}}$$

This formula yields values absolutely identical with those obtained by the use of the standard formula and it has obvious practical advantages. It may be observed that the two radicals are respectively the equivalents of the two standard deviations.

The following table shows the complete list of zero order coefficients.

	SENSE OF PITCH	SENSE OF INTENSITY	SENSE OF TIME	SENSE OF CONSONANCE	TONAL MEMORY	VOCABULARY
Vocal expression..	+0.4847	+0.1817	+0.1040	+0.3170	+0.3408	+0.2742
Sense of pitch.....		+0.3179	+0.3029	+0.7780	+0.5224	+0.2402
Sense of intensity			+0.2257	+0.2412	+0.2018	−0.0082
Sense of time.....				+0.4781	+0.2790	+0.0782
Sense of consonance...........					+0.7530	+0.3533
Tonal memory....						+0.2754

A casual inspection of the above data at once raises the question as to whether it is worth while to attempt a combination of *all* of the tests in the proposed battery. The most dubious candidate for inclusion seems to be the *sense of consonance test.* The correlations of this test with the others are so high, particularly with *sense of pitch* and *tonal memory,* that it is extremely doubtful whether it would add anything to the predictive value of the combination. Some preliminary computations showed clearly that it would not, and consequently it was dropped from consideration.

After the elimination of the sense of consonance test the six remaining variables are:

1. Criterion (vocal expression)
2. Sense of pitch
3. Sense of intensity
4. Sense of time
5. Tonal memory
6. Vocabulary

The zero order coefficients of correlation are:

$r_{12} = +0.4817$

$r_{13} = +0.1817$ $r_{23} = +0.3170$

$r_{14} = +0.1910$ $r_{24} = +0.3029$ $r_{34} = +0.2257$

$r_{15} = +0.3198$ $r_{25} = +0.5521$ $r_{35} = +0.2016$ $r_{45} = +0.2730$

$r_{16} = +0.2742$ $r_{26} = +0.2162$ $r_{36} = -0.0082$ $r_{46} = +0.0728$ $r_{56} = +0.2751$

Coefficients of multiple and partial correlations

It was thought to be advisable to compute the coefficients of multiple correlation, (R), for variables 1–5 inclusive and for variables 1–6 inclusive, and to work out regression equations and prediction formulae for each of the two groups of variables. A complete list of the partial coefficients needed for these computations is herewith presented.

Partial correlation coefficients of the first order

$r_{13.2} = +0.0332$
$r_{14.2} = +0.0565$
$r_{15.2} = +0.1293$
$r_{16.2} = +0.1827$
$r_{34.2} = +0.1429$
$r_{35.2} = +0.0440$
$r_{36.2} = -0.0941$

$r_{45.2} = +0.1462$
$r_{46.2} = -0.0019$
$r_{56.2} = +0.1772$
$r_{12.5} = +0.3774$
$r_{13.5} = +0.1210$
$r_{14.5} = +0.1072$
$r_{16.5} = +0.1975$

$r_{23.5} = +0.2539$
$r_{24.5} = +0.1917$
$r_{26.5} = +0.1245$
$r_{34.5} = +0.1800$
$r_{36.5} = -0.0677$
$r_{46.5} = -0.0043$
$r_{15.3} = +0.2966$

Partial correlation coefficients of the second order

$r_{14.23} = +0.0523$
$r_{15.23} = +0.1280$
$r_{16.23} = +0.1867$
$r_{45.23} = +0.1434$
$r_{46.23} = +0.0116$
$r_{56.23} = +0.1823$

$r_{12.46} = +0.3654$
$r_{13.45} = +0.1039$
$r_{16.45} = +0.1990$
$r_{23.45} = +0.2271$
$r_{26.45} = +0.1276$
$r_{36.45} = -0.0680$

$r_{12.36} = +0.3611$
$r_{16.35} = +0.1910$
$r_{24.35} = +0.1534$
$r_{26.35} = +0.1408$
$r_{46.35} = +0.0070$
$r_{14.36} = +0.1101$

Partial correlation coefficients of the third order

$r_{14.235} = +0.0345$ $r_{15.234} = +0.1219$ $r_{26.345} = +0.1470$

$r_{16.235} = +0.1494$ $r_{16.234} = +0.1863$ $r_{13.456} = +0.3499$

$r_{15.236} = -0.0149$ $r_{56.234} = +0.1825$ $r_{12.456} = +0.1200$

$r_{12.345} = +0.0230$ $r_{12.346} = +0.3527$ $r_{23.456} = +0.2383$

$r_{16.345} = +0.2076$

Partial correlation coefficients of the fourth order

$r_{12.3456} = +0.3333$ $r_{14.2356} = +0.0320$ $r_{46.1235} = -0.0203$

$r_{13.2456} = +0.0102$ $r_{15.2346} = +0.0909$ $r_{56.1234} = +0.1637$

$r_{16.2345} = +0.1084$

There are always two ways of writing the formula for the coefficient of multiple correlation.[10] For five variables these are:

$$(1)\ R_{1(2345)} = \sqrt{1 - (1 - r^2_{15})(1 - r^2_{14.5})(1 - r^2_{13.45})(1 - r^2_{12.345})}$$

$$(2)\ R_{1(2345)} = \sqrt{1 - (1 - r^2_{12})(1 - r^2_{13.2})(1 - r^2_{14.23})(1 - r^2_{15.234})}$$

In the present instance the two formulae yield:

$$(1)\ R = +0.4969$$
$$(2)\ R = +0.4920$$

respectively. The slight discrepancy is doubtless due to dropping off decimals. Thus it may be foreseen that the four tests when given optimum weights and combined will yield a coefficient of correlation with the criterion about 0.01 higher than does the first test singly.

The two writings of the multiple correlation formula for six variables are:

$$(1)\ R_{1(23456)} = \sqrt{1 - (1 - r^2_{16})(1 - r^2_{15.6})(1 - r^2_{14.56})(1 - r^2_{13.456})(1 - r^2_{12.3456})}$$

$$(2)\ R_{1(23456)} = \sqrt{1 - (1 - r^2_{12})(1 - r^2_{13.2})(1 - r^2_{14.23})(1 - r^2_{15.234})(1 - r^2_{16.2345})}$$

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[10] G. U. Yule, Introduction to the theory of statistics. Charles Griffin and Co., 1919, pp. 248 and 249.

Curt Rosanow, The analysis of mental functions. Psychological Review Monograph Supplements, Vol. XXIV, No. 5, pp. 17 to 20.

These yield respectively:

$$(1)\ R = +0.5200$$
$$(2)\ R = +0.5203$$

indicating that the addition of the vocabulary test raises the predictive value of the battery approximately 0.025. The gain over the correlation between the criterion and the first test is disappointingly slight. It shows that when the correlation between one test and a criterion is very high, it is impossible to raise the correlation substantially if additional tests have any considerable tendency to correlate with the first test.[11]

Partial standard deviations

In preparing for the solving of the regression equations for the two sets of variables, we next proceed to compute the necessary partial standard deviations. The standard deviations for the six variables may be found in table 1.

Rosanow gives formulae for five partial standard deviations.[12] Those for six partial standard deviations written by analogy from Rosanow's formulae are:

$$\sigma_{1.23456} = \sigma_1\sqrt{1 - r^2_{12}}\ \sqrt{1 - r^2_{13.2}}\ \sqrt{1 - r^2_{14.23}}\ \sqrt{1 - r^2_{15.234}}\ \sqrt{1 - r^2_{16.2345}}$$

$$\sigma_{2.13456} = \sigma_2\sqrt{1 - r^2_{26}}\ \sqrt{1 - r^2_{24.6}}\ \sqrt{1 - r^2_{25.46}}\ \sqrt{1 - r^2_{23.456}}\ \sqrt{1 - r^2_{12.3456}}$$

$$\sigma_{3.12456} = \sigma_3\sqrt{1 - r^2_{35}}\ \sqrt{1 - r^2_{34.5}}\ \sqrt{1 - r^2_{23.45}}\ \sqrt{1 - r^2_{13.245}}\ \sqrt{1 - r^2_{36.1245}}$$

$$\sigma_{4.12356} = \sigma_4\sqrt{1 - r^2_{45}}\ \sqrt{1 - r^2_{34.5}}\ \sqrt{1 - r^2_{24.35}}\ \sqrt{1 - r^2_{14.235}}\ \sqrt{1 - r^2_{46.1235}}$$

$$\sigma_{5.12346} = \sigma_5\sqrt{1 - r^2_{54}}\ \sqrt{1 - r^2_{35.4}}\ \sqrt{1 - r^2_{25.34}}\ \sqrt{1 - r^2_{15.234}}\ \sqrt{1 - r^2_{56.1234}}$$

$$\sigma_{6.12345} = \sigma_6\sqrt{1 - r^2_{56}}\ \sqrt{1 - r^2_{46.5}}\ \sqrt{1 - r^2_{36.45}}\ \sqrt{1 - r^2_{26.345}}\ \sqrt{1 - r^2_{16.2345}}$$

The formulae for the partial standard deviations yield the following values for the five variables:

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[11] C. L. Hull, The joint yield from teams of tests. Journal of Educational Psychology, October, 1923, pp. 396 to 400.

[12] Curt Rosanow, op. cit., pp. 39 to 45.

$$\sigma_{1.2345} = 16.2060$$
$$\sigma_{2.1345} = 8.3352$$
$$\sigma_{3.1245} = 5.3887$$
$$\sigma_{4.1235} = 5.7995$$
$$\sigma_{5.1234} = 14.4003$$

and the following values for the six variables:

$$\sigma_{1.23456} = 16.0258$$
$$\sigma_{2.13456} = 8.3047$$
$$\sigma_{3.12456} = 5.3531$$
$$\sigma_{4.12356} = 5.7983$$
$$\sigma_{5.12346} = 14.2027$$
$$\sigma_{6.12345} = 9.0878$$

Regression equation and prediction formula for criterion and four tests

We are now in possession of all the data needed for the solution of the two regression equations which have been our ultimate objectives. Let us first write and solve the equation for five variables. The formula follows:

$$x_1 = r_{12.345}\frac{\sigma_{1.2345}}{\sigma_{2.1345}}\,x_2 + r_{13.245}\frac{\sigma_{1.2345}}{\sigma_{3.1245}}\,x_3 + r_{14.235}\frac{\sigma_{1.2345}}{\sigma_{4.1235}}\,x_4 + r_{15.234}\frac{\sigma_{1.2345}}{\sigma_{5.1234}}\,x_5$$

When the proper values have been substituted in this formula, we have:

$$x_1 = 0.0883x_2 + 0.0694x_3 + 0.0967x_4 + 0.1377x_5$$

Before rewriting this equation in the form useful for work with the raw scores, (X) we may correct the weights in such a way as to restore the original distribution of the grades on the criterion. Theoretically our σ on the criterion should be 20. In the present case it was 18.77. This is the first factor for which we must compensate. More important than this, however, is the condensation of the prospective distribution which would result from the use of the weights just obtained for prediction purposes, due to the fact that the coefficient of *multiple correlation*, (R) is 0.4969 *instead of* 1.00. If we should attempt to use the weights just obtained to predict scores on the criterion we should find ourselves unable to predict either any very good or very poor readers—our weights are too small to spread the predicted scores out toward the extremes as we find the actual scores spread.[13]

Therefore, we restore the original spread by multiplying each of the weights by a constant term obtained from the following formula:

$$c = \frac{\sigma'_1}{R_{\sigma_1}}$$

Where c = the constant term; σ'_1 the standard deviation desired in the predicted scores; σ_1 the actual standard deviation of the original criterion scores; and R the coefficient of multiple correlation. Substituting we have:

$$c = \frac{20}{0.4969 \times 18.77} = 2.1413$$

Multiplying the weights in our regression equation by this constant value, we convert our regression equation into a prediction formula:

$$x_1 = 1.4759x_2 + 0.1488x_3 + 0.2075x_4 + 0.2953x_5$$

Substituting the means of the variables and combining numerical values we arrive at the form of our prediction formula which is available for immediate use with the raw scores on the tests:

$$X_1 = 1.4759X_2 + 0.1488X_3 + 0.2075X_4 + 0.2953X_6 - 113.3278$$

Regression equation and prediction formula for criterion and five tests

The working formula for six variables is:

$$x_1 = r_{12\cdot3456} \frac{\sigma_{1\cdot23456}}{\sigma_{2\cdot13456}} x_2 + r_{13\cdot2456} \frac{\sigma_{1\cdot23456}}{\sigma_{3\cdot12456}} x_3 + r_{14\cdot2356} \frac{\sigma_{1\cdot23456}}{\sigma_{4\cdot12356}} x_4 + r_{15\cdot2346} \frac{\sigma_{1\cdot23456}}{\sigma_{5\cdot12346}}$$
$$x_5 + r_{16\cdot2345} \frac{\sigma_{1\cdot23456}}{\sigma_{6\cdot12345}} x_6$$

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[13] C. L. Hull, Prediction formulae for teams of aptitude tests. Journal of Applied Psychology, September, 1923, pp. 277 to 284.

Substituting the proper values we have:

$$x_1 = 0.6333x_2 + 0.1204x_3 + 0.0901x_4 + 0.1026x_5 + 0.2970x_6$$

The constant term by which these weights must be multiplied to convert the regression equation into a prediction formula, as before explained, is:

$$\frac{20}{0.52 \times 18.77} = 2.049$$

The correct weights are then:

$$x_1 = 1.2076x_2 + 0.2467x_3 + 0.1846x_4 + 0.2102x_5 + 0.6084x_6$$

Substituting $(X-M)$ for (x) and combining the non-literal values as in the preceding case we have our prediction formula for the five tests:

$$X_1 = 1.2076X_2 + 0.2467X_3 + 0.1846X_4 + 0.2102X_5 + 0.6086X_6 - 146.3294$$

Now if these weights are correct we should be able to go back over the scores of the 210 subjects on the five tests and predict scores on the criterion which will correlate with the actual scores to the extent of our R which for the criterion and the five tests was $+0.5200$ In order to facilitate these calculations, a table was prepared showing all possible products of the respective weights by the scores made in each test.

The coefficient of correlation between the predicted scores and the actual scores, as computed by means of our adapted products-moment formula, is $+0.5098$ which is a little short of the true figure. This may be the result of slight errors in calculation, or it may be due simply to the dropping of decimals; all decimals were dropped from the predicted scores. The mean of the predicted scores is 49.98 as compared with 50 for the actual scores, a very close approximation. The σ for the predicted scores is 19.82 as against 20 for the actual scores.

TABLE 2

Products of test scores by prediction formula weights

SCORE	SENSE OF PITCH X_2	SENSE OF INTENSITY X_3	SENSE OF TIME X_4	TONAL MEMORY X_5	VOCABULARY X_6
10				2.102	
11				2.312	
12				2.522	
13				2.733	
14				2.943	
15				3.153	
16				3.363	
17				3.573	
18				3.784	
19				3.994	
20				4.204	
21				4.414	
22				4.624	
23				4.835	
24				5.045	
25				5.255	
26				5.465	
27				5.675	
28				5.886	
29				6.096	
30				6.306	
31				6.516	
32				6.726	
33				6.937	
34				7.147	
35				7.357	
36				7.567	
37				7.777	
38				7.988	
39				8.198	
40	51.880			8.408	24.344
41	53.177			8.618	24.953
42	54.474			8.828	25.561
43	55.771			9.039	26.170
44	57.068			9.249	26.778

TABLE 2—*Continued*

SCORE	SENSE OF PITCH X_1	SENSE OF INTENSITY X_2	SENSE OF TIME X_4	TONAL MEMORY X_5	VOCABULARY X_6
45	58.365			9.459	27.387
46	59.662			9.669	27.996
47	60.959			9.879	28.604
48	62.256			10.090	29.213
49	63.553			10.300	29.821
50	64.850		9.230	10.510	30.430
51	66.147		9.415	10.720	31.039
52	67.444		9.599	10.930	31.647
53	68.741		9.784	11.141	32.256
54	70.038		9.968	11.351	32.864
55	71.335		10.153	11.561	33.473
56	72.632		10.338	11.711	34.082
57	73.929		10.522	11.981	34.690
58	75.226		10.707	12.192	35.299
59	76.523		10.891	12.402	35.907
60	77.820	14.802	11.076	12.612	36.516
61	79.117	15.049	11.261	12.822	37.125
62	80.414	15.295	11.445	13.032	37.733
63	81.711	15 542	11.630	13.243	38.342
64	83.008	15 789	11.814	13.453	38.950
65	84.305	16.035	11.999	13.663	39.559
66	85.602	16.282	12.184	13.873	40.168
67	86.899	16.529	12.368	14.083	40.776
68	88.196	16.776	12.553	14.294	41.385
69	89.493	17.022	12.737	14.504	41.993
70	90.790	17.269	12.922	14.714	42.602
71	92.087	17.516	13.107	14.924	43.211
72	93.384	17.762	13.291	15.134	43.819
73	94.681	18.009	13.476	15.345	44.428
74	95.978	18.256	13.660	15.555	45.036
75	97.275	18.502	13.845	15.765	45.645
76	98.572	18.479	14.030	15.975	46.254
77	99.869	18.996	14.214	16.185	46.862
78	101.166	19.243	14.399	16.396	47.471
79	102.463	19.489	14.583	16.606	48.079

TABLE 2—*Concluded*

SCORE	SENSE OF PITCH X_2	SENSE OF INTENSITY X_3	SENSE OF TIME X_4	TONAL MEMORY X_5	VOCABULARY X_6
80	103.760	19.736	14.768	16.816	48.688
81	105.057	19.983	14.953	17.026	49.297
82	106.354	20.229	15.137	17.236	49.905
83	107.651	20.476	15.322	17.447	50.514
84	108.948	20.723	15.506	17.657	51.122
85	110.245	20.969	15.691	17.867	51.731
86	111.542	21.216	15.876	18.077	52.340
87	112.839	21.463	16.060	18.287	52.948
88	114.136	21.710	16.245	18.498	53.557
89	115.433	21.956	16.430	18.708	54.165
90	116.730	22.203	16.614	18.918	54.774
91	118.027	22.450	16.799	19.128	55.383
92	119.324	22.696	16.983	19.338	55.991
93	120.621	22.943	17.168	19.549	56.600
94	121.918	23.190	17.352	19.759	57.208
95	123.215	23.436	17.537	19.969	57.817
96	124.512	23.683	17.722	20.179	58.426
97	125.809	23.930	17.906	20.389	59.034
98	127.106	24.177	18.091	20.600	59.643
99	128.403	24.423	18.275	20.810	60.251
100	129.700	24.670	18.460	21.020	60.860

Summary and conclusions

Of what practical value is a battery of aptitude tests correlating to the extent of +0.52 with a criterion? Those who have never attempted to assemble a group of prognostic tests may consider a coefficient of +0.52 too small to be worth much. It may be asserted that a relationship represented by a coefficient of this size means that the predictions issuing from the use of the tests will be wrong as frequently as they will be right. This attitude rests upon a failure to understand the essential nature of correlation.

There are doubtless present in our computation many factors which attenuate our coefficient. At least two such factors should be noted.

Inaccuracy of the measures

Although the final score on each test was the average of two trials, it was probably still some distance from an accurate measure of the subjects' true ability. One reason for this is the inevitable confusion between the physiological and the cognitive thresholds in the Seashore tests.[14] It was not unusual to find a subject who in one of his records on the pitch test, usually the first, distinguished between the two tones in some of the columns where the difference was relatively large but confused the higher with the lower. Such a subject evidently *knew* that the two pitches differed even though he was mistaken as to the direction of the difference. In other words, the record showed a poor *knowledge* of pitch rather than a poor *sense* of pitch.

If time permitted, all subjects should be given training enough to obviate such gross inaccuracies of measurement. There can be no question but that they cut down the coefficient of correlation. On this basis we are justified in maintaining that if the measures were accurate we should probably have a higher correlation.

As was stated in the preceding chapter, the formula for the conversion of ranks into linear units presupposes a symmetrical, bell-shaped distribution. Since, from a careful examination of the data, it is doubtful whether the distribution actually conforms strictly to this standard, the application of the formula probably introduces another factor of attenuation. The one comforting aspect of this situation is that the resulting correlations are *less* than the true correlations, and that our conclusions as to the relations between tests and criterion err on the side of modesty rather than over-statement.

Importance of the pitch factor

One fact which seems to emerge unambiguously from the mass of correlations, intercorrelations partial correlations, and multiple correlations is that the sense of pitch is of central importance in auditory experience and in vocal expression. Since the test of sense of pitch is correlated with our criterion to the extent of +0.4847, and since the addition of four other tests raises this figrre by less than 0.04, it becomes apparent that sense of pitch somehow is carrying most of the load.

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[14] C. E. Seashore, op. cit., p. 52.

Sense of pitch and intelligence

Seashore asserts that sense of pitch does not vary with sex and that it is not correlated with intelligence. It may have been observed that there was considerable correlation between the scores on sense of pitch and vocabulary. While +0.2462 is not high, it is approximately six times its probable error which is only 0.0431 and it therefore seems to be real. Seashore's conclusions on this point rests "upon evidence from various angles in many thousands of cases." The one case cited is vague, but it rests upon a correlation between teachers' estimates of pupils' school ability and their scores in sense of pitch tests. The statistical method used was a quintile table. Even here the results indicated a slight positive relationship which Seashore admits. He accounts for this by saying: "Some children are so backward mentally that they are not able to do credit to their actual psycho-physic capacity." It seems to me that, while this explanation may be correct, it would be altogether simpler to conclude that there *is* some correlation.

I gave the Army Alpha and the Seashore tests to 94 subjects. The coefficients of correlation (Spearman's Rank Method) between the scores on the Army tests and the scores on the Seashore tests were:

1. Army Alpha and sense of pitch = +0.35
2. Army Alpha and sense of intensity = +0.24
3. Army Alpha and sense of time = +0.12
4. Army Alpha and sense of consonance = +0.06
5. Army Alpha and tonal memory = +0.26

Implications for the teaching of vocal expression

What is there in the data brought forth by these studies that may be of practical significance for those whose major interest lies in teaching vocal expression? Have we discovered anything which is immediately and definitely utilitarian and, if so, what?

If we are justified in our tentative analysis of talent for vocal expression, then it behooves us to examine carefully the elements which we have been testing with a view to ascertaining which of them, if any, are susceptible of improvement through training. For example, if the sensitiveness of the ear to pitch differences is associated with skill in using the voice expressively, then we should consider the question of improving and using this capacity in the student of vocal expression.

Seashore, Smith, Buffum, and others agree that the sense of pitch cannot be improved by training. Such improvement in discrimination as arises from practice is held to be the result of bringing the cognitive threshold down toward the physiological threshold. In one statement Seashore rather confuses his stand by remarking: "The training in agreeableness of speech may furnish more refinement of the sense of pitch than instruction in the piano does." It may be wondered how anything can "refine" that which is incapable of modification through training. It would seem clear that, whatever the essential nature of the improvement, every effort should be made to develop the cognitive aspects of the sense of pitch as completely as possible; the ultimate aim being to make the cognitive and physiological limits of differential audition coincide. To this end, the use of the Seashore phonograph tests may be commended as furnishing a simple and available means for training in pitch discrimination.

In so far as the Terman-Binet-Simon word list is a bona fide test of general intelligence, it seems reasonable to conclude that as the capacity for the handling of concepts increases, vocal expression improves. Certain it is that the commonplace maxim of speech teaching, viz., that impression or intellectual assimilation must precede expression, finds support in these investigations. It is scarcely possible to place too much emphasis upon the necessity for understanding and appreciating the meanings of words which are to be uttered in interpretative reading.

Since each of these factors of vocal expression is important, individual differences in them among students become significant. By reference to the scores given in the preceding chapter, we may gain some appreciation of the spread of distribution in these auditory capacities. Seashore says:

> One person may hear a difference of $\frac{1}{4}$ d.v., less than $\frac{1}{200}$ of a tone, whereas another may not be able to hear any smaller difference than a half tone or even more; counting $\frac{1}{4}$ d.v. as the best and 50 d.v. as the poorest case observed, it appears that one may be at least two hundred times as keen as another in this capacity.

The scores made by my 210 subjects in all of the tests indicate differences of similar magnitude.

The tests may perform a valuable service for the teacher of vocal expression in suggesting the significant limitations and the special capacities among the students. If, for example, a teacher gives the students the pitch test and finds that a particular individual has a very bad ear for pitch difference, it would seem the part of wisdom not to expect such a student to make effective use of the pitch element in vocal expression. Probably the best procedure would be to train the subject to compensate for such deficiency by substituting variety in volume, time and quality for pitch changes.

Future studies

It should be clear from what has been said thus far that experimental studies of vocal expression and associated problems are but beginning. If after having gone through the process once, one could recommence such a series of studies as has been described, it would be possible to do many things more effectively. As an investigator works through one problem, new problems and suggested methods of attack loom on every hand. If the present studies help to map out some slight portion of terra incognita and to suggest ways by which more may be surveyed, they will not have been wholly vain. To that end it may be worth while to indicate briefly what now appear to be the future studies most likely to bear valuable fruit.

Emotion and vocal expression

Vocal expression originates as emotional response and emotion is being looked to more and more for the explanation of many of the basic phenomena of voice. The work of Blanton and others has proceeded upon the thesis that abnormalities in vocal expression are directly traceable to stress, strain, and conflict in the emotional life. From time immemorial there has been a general agreement among teachers and students of vocal expression that the voice is conditioned and controlled by emotional states.

It is not difficult to see how this idea has acquired its popularity. What we need at this point is some more generally accepted definition of emotion and more accurate ways of getting objective measures of emotional states and phenomena, particularly of *emotional sensitivity* and *control*. We should seek to measure the sensitiveness to emotional stimuli first of all. But more important than this must be the *type* of emotional response. It would seem more than probable that unless a reader is responsive to emotional values and suggestions, he is bound to be cold and inexpressive vocally. And yet it is quite conceivable that he may be *too* sensitive or at least too uncontrolled in his response.

The plethysmograph, the pneumograph, the cardiograph, the psycho-galvanic reflex, the verbal report, blood tests, etc., suggest themselves as possible methods of approach. We need objective measures of emotional responses and these objective measures must be carefully studied with reference to the psychological states with which they are correlated. Then the capacity for vocal expression must be measured in some way and the relation between this criterion and the phenomena of emotional response carefully considered.

Neuro-muscular coördination and voice

Voice is produced by the same sort of mechanism as is manifested in walking, breathing, handwriting, etc., viz., by the contraction and relaxation of muscles. Numerous muscles must work together properly to make articulate vocalization possible. It then appears obvious that skill and effectiveness in the coördinated use of these muscles determines vocal expressiveness. Here is a rich and exceedingly promising field for investigation and, moreover, one which lends itself readily to experimental methods. Here are involved the following factors of voice control, according to Scripture's analysis already cited: reflex tonus, force of movement, accuracy of movement, precision of movement, accuracy of coördination, quickness of response, and general voluntary control. We are indebted to Scripture for suggestions as to how some of these various factors may be measured. He proposes that we study muscle tonus with a tonal dynamometer. He also explains methods of measuring force of movement in the respiratory muscles and in muscles of the lips and tongue.

Scripture holds that vocal control is dependent upon general voluntary control and that studies of arm and finger movement furnish results which are directly applicable to the problem of voice control. If we accept this point of view, we may go forward with some of the recognized methods for the study of reaction, time, speed of movement, accuracy of movement, etc. By applying the technique of correlation to our results we may be able to interpret them in terms of their relation to a criterion adequately representing vocal expression.

THE FEELING VALUE OF LINES

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Among the factors that determine the affective value of any visual presentation (such as color, subject, balance, light and shade), line forms have occupied an important position in the opinions of writers on Aesthetics. Cox[1] says:

> Straight lines will always express rigidity and stiffness while curves will express some sort of growth or motion. The vertical line is a line of stability, of strength and vigor. . . . . All these characteristics of lines may be the result of association or they may have some deeper reason, but they are there, in the lines themselves, without regard to what the lines may be used to represent, and are the most valuable means to artistic expression.

According to Puffer[2]

> The moment we touch upon line form, we are already, in strictness, beyond the elements. For with form enters the motor factor, which cannot be separated from the motor innervations of the whole body.
>
> It is possible, however, to abstract for the moment, from the form as a unit, and to consider here only what may be called the quality of a line. A line may be straight or broken, and if curved, curved continuously or brokenly, etc. That this quality of a line is distinct from the form may be shown by the simple experiment of turning a spiral in different ways around its focus. The aesthetic effect of the figure is absolutely different in the different positions, and yet the feeling about the character of the line itself seems to remain the same.
>
> The very process of apprehending a line involves not only motor memories and impulses, but numberless ideal associations, and these associations constitute the line as truly as do the others. The impression of the line involves expression, a meaning which we cannot escape.

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[1] Concerning painting, pp. 44ff.

[2] Ethel D. Puffer, Psychology of beauty, p. 102, 116.

Münsterberg[3] interprets the effects of lines as follows:

> Every curve or line or space division is thus psychologically a system of eye movement sensations. The optical impression, as it is at present and for itself alone, may absorb our mind; then the motor impulse to the organism will discharge itself and lead to localized tensions and movement sensations.
>
> The result must be that the feelings of strain and impulse that go on in ourselves are not projected into our body, but into the visual impressions; just as the optical sensations were all the time joining themselves with the movement sensations of the eye muscles, so in this case optical sensations and eye muscle sensations are fusing with sensations of bodily tension, and while the muscle sensations of the eyes give the local values and distance relations to the light impressions and thus build up ideas of geometrical forms, these sensations of impulse and strain give to the optical form an element of force and energy.
>
> We are contracting our muscles, but we feel as if the lines were pulling and piercing, bending and lifting, pressing down and pushing up; in short, as soon as the visual impression is really isolated and all other ideas really excluded, then the motor impulses do not awake actions which are actions of ourselves, but feelings of energy which are taken as energies of the visual forms and lines.

Hollingworth,[4] in discussing the feeling tone of advertisements, says:

> This feeling tone of lines can be used to advantage in representing advertised articles both by relevant and irrelevant cuts, and should also be considered in the appropriate selection of type faces. The feeling tone of a line depends upon three chief factors; its quality; its direction; and its character, as straight or curved.

Lundholm[5] reports an experimental study of the feeling value of lines. The problem is indicated in the following statement:

> Literature about art very often gives us descriptions of masterpieces wherein pure lines are characterized by adjectives that indicate a more or less emotional quality. Thus authors used to write about melancholy lines in the paintings of Perugino, quiet lines in certain classical schools,

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[3] Hugo Münsterberg, Principles of art education, p. 82ff.

[4] H. L. Hollingworth, Advertising and selling, p. 142.

[5] The affective tone of lines: Experimental researches. Psychol. Rev., 1921, vol. 28, p. 43–60.

violent lines in the baroque art, etc. Out of these facts there arises a problem. Is the effective character of a line a quality which is bound to the line itself, or is it suggested by the literary subject of the masterpiece? Furthermore, is this quality a phenomenon that appears equally to different observers?

Lundholm presented to a group of eight subjects a series of forty-eight adjectives, which could be grouped into thirteen classes, all the terms in a class being synonyms. Each subject was instructed to draw upon a sheet of white paper 21 by 27 centimeters a line which should express the affective tone of one of the adjectives. Subjects were allowed complete freedom in these reactions with this exception: They "were requested to express the adjectives as far as possible by pure line, not to symbolize sadness by the curve of a melancholy mouth or strength by a line suggesting the contour of a rock formation, etc."

When the lines thus produced were studied there were found to be striking uniformities among the subjects in their reactions to the various adjectives, in the use of curves and angles, slow and fast rhythm and direction of lines. The following condensed table (table 1) showing the reactions of the subjects to the thirteen classes[6] of adjectives is adapted from Lundholm. The names at the top of the table indicate the nature of the line, e.g., curves: big, medium and small; and direction horizontal, up and down. The letters refer to the lines in Figure 1,[7] where the character of the various lines is illustrated. The numbers in the body of the table represent, in terms of per cent, the lines of a given type that were drawn to express each of the thirteen classes of feeling.

Inspection of this table reveals a high degree of agreement in most cases. For example, a big curve (like A, B or C) expresses "sad" in 82 per cent of the cases, "quiet" in 100 per cent of the cases, and "lazy" in 92 per cent of the cases. On the contrary a line with small angles expresses "hardness" in 46 per cent of the cases. Inspection of the last three columns of table 1 shows the importance of the direction of lines. A line moving downward (like C, F or I) expresses "sad" in 84 per cent of the cases, while a line moving upward (like B, E or H) expresses "merry" in 58 per cent of the cases.

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[6] In the table each class is represented by only one adjective. The complete list will be given later (see page 193).

[7] Figure 1 is not taken from Lundholm but forms a part of the writers' experiment and will be described later.

The following passages sum up Lundholm's findings:

TABLE 1

Feelings and the lines that represent them

(Adapted from Lundholm)

	CURVES			ANGLES			DIRECTION		
	Big	Medium	Small	Big	Medium	Small	Horizontal	Up	Down
	ABC	DEF	GHI	JKL	MNO	PQR			
1. Sad	82.0	10.0	5.0				13.0	3.0	84.0
2. Quiet	100.0						81.0	3.0	10.0
3. Lazy	92.0						29.0	4.0	63.0
4. Merry	8.4	18.0	50.0				40.0	58.0	2.0
5. Agitating	2.0	2.0	7.0			14.0	52.0	41.0	7.0
6. Furious	2.5		2.5			21.0	44.0	38.0	13.0
7. Dead	69.0			6.0	6.0		75.0		25.0
8. Playful		13.0	26.0				38.0	50.0	12.0
9. Weak	41.0	6.0	25.0				44.0	0.0	47.0
10. Gentle	75.0	6.0	13.0				75.0		25.0
11. Hard		4.0		4.0	25.0	46.0	54.0	17.0	21.0
12. Serious	69.0	19.0	3.0				38.0	18.0	44.0
13. Powerful	25.0	38.0	4.0	4.0	21.0	4.0	37.0	50.0	13.0

Lines symbolizing states of strong motor expression have short waves and acute angles and lines symbolizing states of weak motor expression have long and low waves; and second, that lines with waves of the former type and acute angles themselves suggest intense motion, while lines with waves of the latter type suggest weak and slow motion. This justifies us in supposing that the effective character of lines has its origin in the suggestion of movement of the line, that it depends upon the idea that this movement in some way imitates the motor expression of an emotion. This supposition becomes greatly strengthened by the fact that the subjects themselves have mentioned the movement as being of importance for the emotional expression of the lines.

Concerning direction of lines:

> The downward tendency of a line expresses relaxation, the upward expresses power. The downward tendency expresses faintness, not sufficient strength to keep up. Going downwards expresses losing of energy. The doleful line droops without energy. If it had force it would have ascended higher. Strength is expressed by going upwards. A joyous line also ascends. Joy is an uplifting feeling. A forceful line tends upwards. Thereby it obtains the idea of ambition. A line indicating strength is a line tending upwards, never downwards.
>
> Therefore, it seems to be obvious that even the direction of the lines to a certain extent imitates the motor expression of an emotional state and that consequently the direction is one of the factors that partakes in giving them their affective tone. Direction upwards expresses strength, energy, force, ambition, uplifting feelings, etc., direction downwards, weakness, lack of energy, relaxation, depression, etc.

In the experiment of Lundholm, then, the subjects *drew lines* which represented their feelings. The subjects were necessarily few on account of the labor of classifying and analyzing the lines drawn. Special interest was directed to an explanation of the feelings associated with lines. In the experiment to be reported in this paper the primary interest was the discovery of the feelings that are aroused in *looking at* lines of various kinds, rather than in drawing them. We were interested in the influence of lines in determining the affective reaction to a work of art, a piece of architecture, or an advertisement. If a motor reaction occurs here, it is limited to eye movements and to incipient rather than overt muscular responses of other mechanisms.

The material for this experiment consisted of the following:

1. A set of eighteen lines, representing the simple classes of lines and their directions discovered by Lundholm in his analysis of his subjects' reactions. These were prepared in the form of white lines on a blue background (blueprints) 8½ by 11 inches in size, arranged in the order shown in figure 1. Each line could be identified by means of a letter printed just above it.

2. A sheet containing forty-seven adjectives arranged into thirteen classes. These classes were the same as used by Lundholm except that the adjective "sprightly" was omitted from class 5, and that the adjective "harsh" was put first in class 11. The first word in each class was underlined.

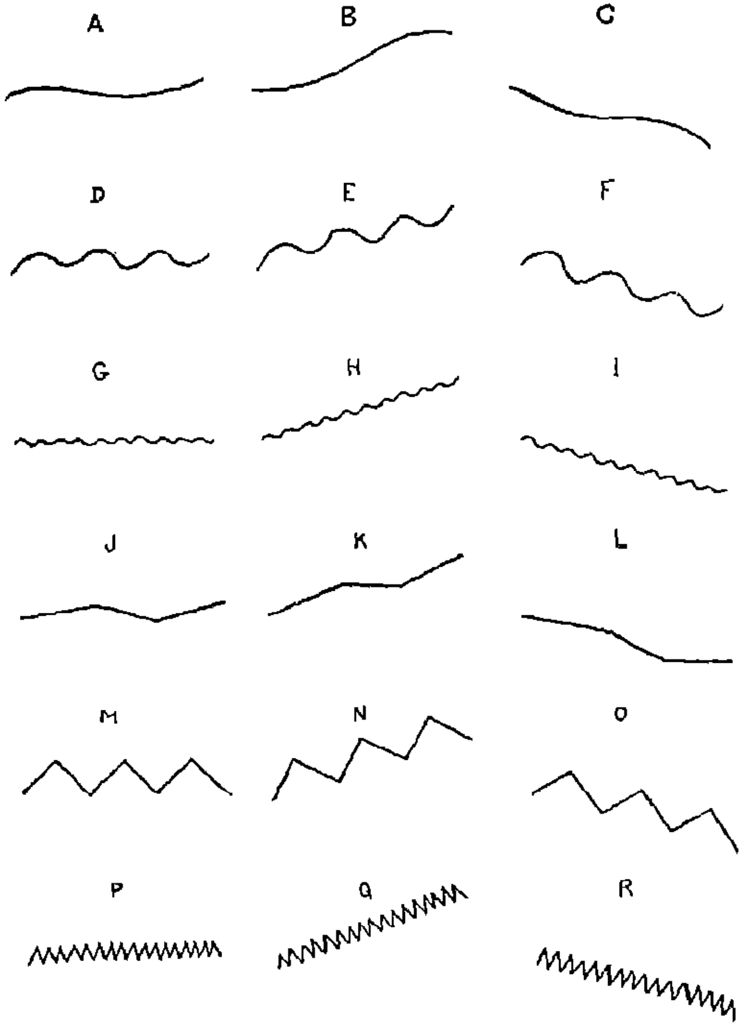

FIG. 1

At the top of the sheet was a set of simple instructions. This sheet is reproduced below. The task to be performed was very simple. Each subject, with the lines before him, began with class 1 of the adjectives and sought among the eighteen lines that one which best expressed the feelings indicated in class 1. The letter designating the line thus chosen was written at the left of the sheet opposite class 1. Then a line was sought for class 2, and so on until the most appropriate line was indicated for each of the thirteen classes. As stated in the instructions the same line could be used to indicate as many feelings as the subject wished.

Five hundred subjects gave their reactions in the course of the experiment. These were originally treated separately in groups ranging in size from 8 to 60, but the differences among groups were too slight to warrant reporting. The group of five hundred taken as a whole probably represents a fair sampling of educated people.

Below you will find thirteen sets of words, each set indicating a particular feeling state or emotional state. The first word in each set will serve as a cue to the others.

On the accompanying chart you will find a series of lines, eighteen in number, each designated by a letter.

Begin with class 1 of the feelings and find that line on the chart that best expresses to you the feelings that class 1 represents. Mark the letter attached to this line in front of class 1 (under "Letter"). Do the same with class 2 of the feelings, and so on until each of the thirteen classes of feelings has been given a letter. You may use the same line as often as you wish.

LETTER

1. Sad, melancholy, mournful, doleful, sorrowful
2. Quiet, calm, tranquil, serene
3. Lazy, indolent, idle
4. Merry, cheerful, gay, jolly, joyous
5. Agitating, exciting, fiery, brisk, vivacious, lively
6. Furious, angry, cross, vexed, enraged
7. Dead, dull
8. Playful
9. Weak, feeble, faint, delicate
10. Gentle, mild
11. Harsh, hard, cruel
12. Serious, solemn, grave, earnest
13. Powerful, forceful, strong

The lines chosen by the five hundred subjects to represent each of the thirteen classes of feelings may be seen in table 2.

TABLE 2

Feelings and the lines that represent them

	CURVES									ANGLES								
	Big			Medium			Small			Big			Medium			Small		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1. Sad	8.3	3.0	65.0	0.9	0.6	4.0	0.9	0.0	3.6	1.8	0.2	8.5	0.0	0.2	1.2	0.2	0.2	2.0
2. Quiet	75.3	4.8	3.2	5.8	0.2	0.2	7.1	0.2	0.4	0.8	0.4	0.0	0.8	0.0	0.2	0.4	0.2	0.2
3. Lazy	17.1	6.1	27.2	9.2	1.2	7.3	3.3	0.8	1.8	7.5	1.4	13.0	0.4	0.4	1.4	1.2	0.0	0.8
4. Merry	0.6	7.4	0.4	6.8	38.1	1.2	4.5	19.9	0.8	0.0	2.9	0.2	1.6	5.7	1.0	2.9	5.5	0.6
5. Agitating	0.0	0.2	0.0	0.4	4.0	1.2	1.8	9.2	0.6	0.8	3.3	0.2	8.9	22.6	2.0	11.2	29.5	4.3
6. Furious	1.1	0.4	0.6	1.8	1.8	0.8	1.2	2.2	0.8	1.4	4.8	1.4	4.0	29.2	6.4	6.9	24.4	10.7
7. Dead	13.6	0.8	19.7	2.5	0.2	1.3	10.7	0.0	4.2	13.8	1.0	21.4	0.8	0.0	1.5	5.2	0.2	2.3
8. Playful	0.2	4.0	0.6	11.1	29.1	2.3	8.7	17.8	2.2	1.4	3.2	0.4	2.4	5.9	1.0	4.4	5.0	0.0
9. Weak	7.4	2.8	18.0	1.8	1.2	9.6	12.2	1.8	14.4	8.8	1.8	14.8	0.2	0.0	1.2	1.2	0.4	2.2
10. Gentle	29.2	9.9	4.7	16.4	2.4	2.6	20.6	1.4	2.4	5.7	1.6	0.6	0.6	0.0	0.2	1.2	0.2	0.2
11. Hard	0.4	0.2	0.2	2.7	0.6	0.8	0.0	1.2	1.0	3.7	4.9	2.4	23.9	18.8	15.7	9.4	4.9	0.2
12. Serious	8.8	5.3	2.7	5.5	1.6	1.4	7.6	1.2	1.4	18.9	8.0	6.8	15.8	1.6	2.3	7.8	1.4	1.6
13. Powerful	1.8	7.6	0.0	2.5	1.2	0.0	0.2	1.6	0.4	1.8	16.0	0.6	24.6	21.1	3.3	7.0	8.0	2.7

The class is indicated at the left of the table by the number and the first adjective in the class (see Record Sheet above). The various lines are indicated at the top of the table by the descriptive terms—curves:[6] big, medium, small: angles: big, medium, small—and also by the letters which refer to figure 1. The numbers in the body of the table give the per cent of the subjects choosing any given line. Thus, for "sad" 8.3 per cent of the five hundred judges chose line A which is a big curve in the horizontal position; 65 per cent chose C which is a big curve in the descending position; 1.8 per cent chose J which is a big angle in the horizontal position; and 2 per cent chose R which is a small angle in the descending position.

TABLE 3

The influence of form and rhythm and direction

	CURVES			ANGLES			DIRECTION		
	Big	Medium	Small	Big	Medium	Small	Horizontal	Up	Down
	ABC	DEF	GHI	JKL	MNO	PQR	ADG JMP	BEH KNQ	CFI LOR
1. Sad	76.3	5.5	4.5	10.5	1.4	2.4	12.1	4.2	84.3
2. Quiet	83.3	6.2	7.7	1.2	1.0	0.8	90.2	5.8	4.2
3. Lazy	50.4	17.7	5.9	21.0	2.2	2.0	38.7	9.9	51.5
4. Merry	8.4	46.1	25.2	3.1	8.3	9.0	16.4	79.5	4.2
5. Agitating	0.2	5.6	11.6	4.3	33.5	45.0	23.1	68.8	8.3
6. Furious	2.1	4.4	4.2	7.6	39.6	42.0	16.4	62.8	20.7
7. Dead	34.1	4.0	14.0	30.2	2.3	7.7	46.6	2.2	50.4
8. Playful	4 8	42.5	28.7	5.0	9.3	9.4	28.2	65.0	6.5
9. Weak	28 2	12.0	28.4	25.4	1.4	3.8	31.6	8.0	60.2
10. Gentle	43.8	21.4	24.4	7.9	0.8	1.6	73.7	15 5	10.7
11. Hard	0.8	4.1	2.2	11.0	58.4	23.5	40.1	30.6	20.3
12. Serious	16.8	8.5	10 2	33.7	19.7	10.8	64.4	19.1	16.2
13. Powerful	9.4	3.7	2.2	18.4	49.0	17.7	37.9	55.5	7.0

From this detailed table others may be compiled to show the influence of various characteristics of the lines. Thus, table 3 combines the percentages for a given shape of line regardless of its direction and for a given direction regardless of shape. In this table it appears that "sad" is represented as a big curve by 76.3 per cent of the subjects (the sum of A, B and C in table 2); as a medium curve by 5.5 per cent; and as a small curve by 4.5 per cent. It is represented by a descending or "downward" line in 84.3 per cent of the subjects. The figures in table 3 may be compared directly with those in table 1 which contains Lundholm's data. It should be remembered that the most striking difference in the methods of obtaining these data is that Lundholm's subjects drew lines to represent feelings while our subjects chose from a set of 18 lines certain ones which represented their feelings.

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[6] In this report the curved or angular character of the line will be called its "form," the size of the waves or angles will be called "rhythm" and the direction will be referred to simply as "direction."

In table 4 a rough comparison is made between these two sets of data. The feeling classes are arranged, according to the amount of agreement, into three groups called "agreement," "agreement moderate" and "disagreement." The "agreement" group may be further divided into two subgroups, namely, the first three where agreement is very close, and the second three where there is a shift of emphasis between medium and fast rhythm. The second group contains cases in which an additional type of line appears in either set of data, but in which there is no shift from curves to angles or vice versa. The third group, "disagreement," contains cases where there is a shift from curves to angles (or vice versa) or a considerable discrepancy within the curve or angle group (as in 13—powerful).

In the "disagreement" group, class 7 (dead) does not represent any serious disagreement since the shift is from big curves to big angles; that is, it seems to be the same slow rhythm of movement that is important in expressing "sad." In the case of class 9 (weak) there are big curves and small curves in both sets of data. The additional type of line is the big angle. The other discrepancies are due, probably, to differences in interpretation of the adjectives. This is especially true in the case of "serious," as shown by introspective reports of the subjects. Lundholm with eight selected subjects could be sure of greater uniformity in interpretation than could be attained with five hundred subjects who followed printed directions.

TABLE 4

Comparison of the two experiments

	LUNDHOLM	POFFENBERGER AND BARROWS
Agreement		
1. Sad	Big curves (82.0)	Big curves (76.3)
2. Quiet	Big curves (100.0)	Big curves (83.3)
3. Lazy	Big curves (92.0)	Big curves (50.4)
4. Merry	Small curves (50.0) Medium curves (18.0)	Medium curves (46.1) Small curves (25.2)
8. Playful	Small curves (26.0) Medium curves (13.0)	Medium curves (42.5) Small curves (28.7)
11. Harsh	Small angles (46.0) Medium angles (25.0)	Medium angles (58.4) Small angles (23.5)
Agreement—moderate		
5. Agitating	Small angles (14.0)	Small angles (45.0) Medium angles (33.5)
6. Furious	Small angles (21.0)	Small angles (42.0) Medium angles (39.6)
10. Gentle	Big curves (75.0)	Big curves (43.8) Small (24.4) Medium (21.4)
Disagreement		
7. Dead	Big curves (60.0)	Big angles (28.4) Big curves (28.0)
9. Weak	Big curves (41.0) Small curves (25.0)	Small curves (28.4) Big curves (28.2) Big angles (25.4)
12. Serious	Big curves (69.0)	Big angles (33.7) Medium angles (19.7) Big curves (16.8)
13. Powerful	Big curves (25.0) Medium curves (38.0) Medium angles (21.0)	Medium angles (49.0) Big angles (18.4) Small angles (17.7)

Certainly this comparison shows the agreements to be more striking than the disagreements. The question arises as to whether the disagreements that do occur are such as one would expect to find if they were due to the one differing factor in the experiments, namely, that in one case lines were drawn and in the other they were looked at. Lundholm speaks of two types of adjectives, those carrying "strong motor expression" and those carrying "small motor expression." In the latter group are classes 1, 2 and 3, and in the former are classes 4, 5 and 6. It is in the cases of classes 1, 2 and 3 that the closest agreement is found between the two sets of data, that is, where motor expression is weak. Thus, one might conclude that the two experiments, one involving motor expression in the form of line drawing movements and the other involving no such motor expression agree best in the case of those feelings whose motor expression is weakest (or where the distinction between the two experiments is at its minimum). However, in the case of classes 7, 9 and 10 where there would seem to be "small motor expression" the agreement between the two experiments is not so close. Still, it must be remembered that even if the motor factor is the important factor in the feeling tone of lines, eye movements and implicit movements of other mechanisms may be good substitutes for the actual line drawing movements, or may even be more important than these.

The nature of the agreements and disagreements revealed by this comparison suggests that it is important to discover what characteristics of the lines, namely, curves or angles, rhythm or direction have the most weight in determining the feeling reactions. An attempt will be made to interpret the data in this fashion in the course of our report.

Let us first compare the direction factor in the two sets of data. Table 1 contains these figures for the Lundholm experiment, and table 3 contains the same for our experiment. The comparison is presented in table 5. As in table 4 we can make three groupings, "agreement," "agreement moderate" and "disagreement." The amount of agreement is determined simply by inspection, as the material does not warrant a more

TABLE 5

The influence of direction

	LUNDHOLM	POFFENBERGER AND BARROWS
	Agreement	
1. Sad	*Down (84.0)*	*Down (84.3)*
2. Quiet	Horizontal (81.0)	Horizontal (90.2)
3. Lazy	Down (63.0) Horizontal (20.0)	Down (51.5) Horizontal (38.7)
4. Merry	Up (58.0) Horizontal (40.0)	Up (79.5) Horizontal (16.4)
5. Playful	Up (50.0) *Horizontal* (38.0)	Up (65.0) *Horizontal* (28.2)
9. Weak	Down (47.0) *Horizontal* (44.0)	Down (60.0) Horizontal (31.6)
10. Gentle	Horizontal (75.0)	Horizontal (73.7)
13. Powerful	Up (50.0) Horizontal (37.0)	Up (55.5) Horizontal (37.9)
	Agreement—moderate	
8. Agitating	Horizontal (52.0) Up (41.0)	Up (68.8) Horizontal (23.1)
7. Dead	Horizontal (75.0) Down (25.0)	Down (50.4) Horizontal (46.6)
	Disagreement	
6. Furious	Horizontal (44.0) Up (38.0) Down (13.0)	Up (62.8) Down (20.7) Horizontal (16.4)
11. Harsh	Horizontal (54.0) Down (21.0) Up (17.0)	Horizontal (40.1) Up (30.6) Down (29.3)
12. Serious	Down (44.0) Horizontal (38.0) Up (18.0)	Horizontal (64.4) Up (19.1) Down (16.2)

refined method. Here again the resemblances between the two sets of data are more striking than the differences. The same relationship between weak motor expression and agreement between the two sets of data and strong motor expression and disagreement holds as appeared in table 4.

The remainder of the report will be concerned with an analysis of our own data from the five hundred subjects. The preceding comparison of the two sets of data raises two questions: (1) What are the essential characteristics of lines representing the different classes of feelings? and (2) what is the relative importance of these different characteristics? The first of these questions may be answered by reference to table 6. Here we find in what per cent of the cases a curve was chosen to represent a class of feelings; in what percent of the cases an angle was chosen; also what rhythm and what direction of line expressed the feeling best. The figures are obtained by totalling the percents shown in table 2. Thus "sad" was represented by some kind of curve in 86.3 per cent of the cases (Table 2, A, B, C, D, E, F, G, H, I,); and by some kind of angle in 14.3 per cent of the cases (table 2, J, K, L, M, N, O, P, Q, R,). "Sad" was also represented by a slow rhythm in 86.8 per cent of the cases (table 2, A, B, C, J, K, L); and by a line in the downward direction in 84.3 per cent of the cases (table 2, C, F, I, L, O, R).

The brief statement in the last column expresses the dominant character of the line representing any of the 13 classes of feelings. Note that the cases of the slow, descending curve are "sad" "lazy", and "weak;" the cases of the slow horizontal curve are "quiet" and "gentle." The medium rising curve represents "merry" and "playful." The rapid or medium rising angle represents "agitating," "furious" and "powerful."

The figures in table 6 do not, however, enable us to answer the second question which concerns the relative importance of the various characteristics of the lines. The total per cents represent the combination of different numbers of lines, (e.g., the curve includes nine lines and the rhythm includes 6 lines). If we find the average per cent per line by dividing by the

TABLE 6

Feelings and their appropriate lines

	FORM		RHYTHM			DIRECTION			
	Curve	Angle	Slow	Medium	Fast	*Horizontal*	Up	Down	
1. Sad	86.3	14.3	86.8	6.9	6.9	12.1	4.2	84.3	Slow descending curve
2. Quiet	97.2	3.0	84.5	7.2	8.5	90.2	5.8	4.2	Slow horizontal curve
3. Lazy	74.0	26.1	72.3	19.9	7.9	38.7	9.9	51.5	Slow descending curve
4. Merry	79.7	20.4	11.5	54.4	34.2	16.4	79.5	4.2	Medium rising curve
5. Agitating	17.4	82.8	4.5	39.1	56.6	23.1	68.8	8.3	Rapid rising angle
6. Furious	10.7	89.2	9.7	44.0	46.2	16.4	62.8	20.7	Rapid or medium rising angle
7. Dead	53.0	46.2	70.3	6.3	22.6	46.6	2.2	50.4	Slow horizontal or descending curve or angle
8. Playful	76.0	23.7	9.8	51.8	38.1	28.2	65.0	6.5	Medium rising curve
9. Weak	69.2	30.6	53.6	14.0	32.2	31.6	8.0	60.2	Slow descending curve
10. Gentle	89.6	10.3	51.7	22.2	26.0	73.7	15.5	10.7	Slow horizontal curve
11. Harsh	7.1	92.9	11.8	62.5	25.7	40.1	30.6	29.3	Medium horizontal angle
12. Serious	35.5	64.2	50.5	28.2	21.0	64.4	19.1	16.2	Slow horizontal angle
13. Powerful	15.3	85.1	27.8	52.7	19.9	37.9	55.5	7.0	Medium rising angle

number of lines added to get a given total, we will have all figures on a comparable basis. Then the largest figure will represent the characteristic of the line which in a given case has the greatest influence. Table 7 presents the figures reduced to such a comparable basis. The classes are grouped into pairs of opposites for easy comparison. The three classes which do not permit of this grouping, namely, "lazy," "furious" and "dead" are placed at the bottom of the table.

TABLE 7

Relative value of different line characters

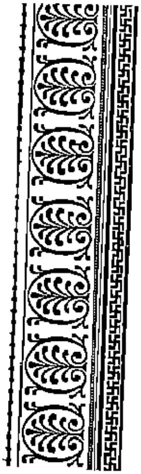
	DIRECTION			RHYTHM			FORM	
	Horizontal	Up	Down	Slow	Medium	Fast	Curve	Angle
1. Sad	2.0	0.7	14.1	14.3	1.2	1.2	9.6	1.6
4. Merry	2.7	13.2	0.7	1.0	9.1	5.7	8.0	2.2
12. Serious	10.7	3.2	2.7	8.4	4.7	3.5	3.9	7.1
8. Playful	4.7	10.8	1.1	1.0	8.6	6.4	8.4	2.0
2. Quiet	15.0	1.0	0.7	14.1	1.2	1.4	10.8	0.3
5. Agitating	3.9	11.5	1.4	0.8	6.5	9.4	1.9	9.2
10. Gentle	12.3	2.6	1.8	8.6	3.7	4.3	10.0	1.1
11. Harsh	0.7	5.1	4.9	2.0	10.4	4.3	0.8	10.3
9. Weak	5.3	1.3	10.0	8.9	2.3	5.4	7.7	3.4
13. Powerful	6.3	9.3	1.2	4.6	8.8	3.3	1.7	9.5
3. Lazy	6.5	1.6	8.6	12.1	3.3	1.3	8.2	2.9
6. Furious	2.7	10.5	3.5	1.6	7.3	7.7	1.2	10.0
7. Dead	7.8	0.4	8.4	11.7	1.1	3.8	5.9	5.1

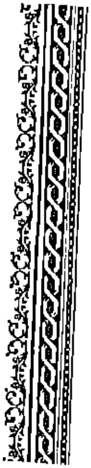
By reading across the table and finding the largest figure we see that in the case of "sad," direction and rhythm of line are equally important while form is less important; in the case of "merry" direction is most important while rhythm and form are less important; in the case of "harsh," rhythm and form are equally important and more so than direction; in the case of "furious," direction and form are most important, and rhythm least important; in the case of "dead," rhythm is most important, direction next and form least important. Now, if we add together the largest scores for direction, for rhythm and for form respectively we get the following totals, 141.1, 132.0 and 115.0 from which we may conclude that in expressing the feelings included in this study, direction of line is generally most important, rhythm next and form least important.

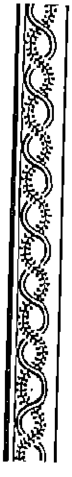
The same table with its groupings into contrasting feelings shows the relationship between lines representing contrasting feelings in respect to direction, rhythm and form. The larger the number in this table, the greater is the effect of the factor which it represents.

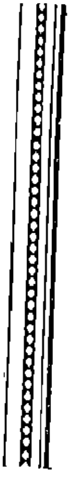
Our experiment offers little in the way of an explanation of the feeling reactions described. A typical introspective report showed the relation between the reactions to the lines and certain popular expressions, as for instance, "down in the dumps," "up in the air," "sharp tongue," "rollicking time." Such ideas came to mind in reacting to "sad," "merry," "playful," etc. Again, there was the association of the idea of the normal with a horizontal line and the departures from the normal or horizontal became indicative of "harshness," "furious," "agitating," etc. Such reports are of little use in determining the real basis of the feeling reactions. It may be that the reactions to the lines are due to these simple associations or that the associations themselves are due originally to the immediate responses to the lines. The predominance of certain lines for expressing certain feelings in a group of subjects of this size might suggest that the feeling reactions are immediate and fundamental responses. Another type of introspective report showed a kind of emotional warmth or glow aroused by curves, especially the larger curves, while the sharp angles gave a feeling of roughness or conflict that could not be further analyzed. For a discussion of the analysis of the feeling reactions to lines the reader is referred to the article by Lundholm.

If the feelings are to be played upon by means of lines in practical life, it makes little difference whether the particular feelings aroused by a line are immediate or the result of associa-









tion, except in regard to their universality and their stability. These are matters that could be measured by getting a wider range of subjects and repeating the tests over a long period of time. The results obtained from this study have some bearing upon those forms of art that are created to influence people's reactions. Thus in advertising the aim is to influence the market for some commodity and no labor or expense is spared to create a pleasing and appropriate atmosphere. Along with appropriate colors and color combinations, appropriate type faces, appropriate balance of light and shade, appropriate line characters may take their place as factors creating favorable responses. Figure 2 shows a series of border designs that form the common stock of the advertiser and the printer. These vary strikingly in rhythm and quality. As far as the writers know, border designs in advertising are prepared merely for their general esthetic effect and for the purpose of novelty. They might be more effectually used by taking account of the relation between quality, direction and rhythm of line and the feelings that are aroused in seeing them.

AN EVALUATION OF SOME INFORMATION QUESTIONS

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One of the inescapable annoyances of the maker of mental tests is the individual who claims that certain performances required by the tests are "obviously" not related to general mental ability. There are few testers who have not suffered from the insistence that there is no relation between the ability to discriminate between synonyms and antonyms and intelligence or that "it stands for reason" that school grades in arithmetic are better measures of intelligence than a test of general information. The natural impatience of the psychologist with this point of view is somewhat restrained by the memory that he himself has only very recently given up the compilation of mental tests out of elements which his "common sense" told him were good measures of mental ability. The random, empirical, search for significant test performances is, in fact, so recent that the majority of testers can still remember when the acceptance of this new method seemed the rejection of reason in favor of a blind groping. The "common sense" method of selecting test elements is by no means extinct in the finer details of test compilation. The present paper reports a small extension of the empirical method that has proven itself of value in selecting information questions as components of mental test batteries.

Three years ago in attempting to evaluate the various parts of the Army Alpha test it became quite apparent that nearly one third of the information questions contributed nothing significant to the final score and that a few questions were answered correctly more often by dull students than by bright.

It was quite impossible to tell with any accuracy by inspection alone the value of a question as a measure of intelligence. The writer does not know in what way the information test questions of the most recent batteries of tests have been selected, but with many of the standard tests the judgment of the compiler was entrusted with this rather difficult task. The assumption has often been implicit that while any particular question may be worthless the score obtained by application of all the questions will have value. It speaks well for the judgment of the inventors of our tests that their information questions are a valuable part of the battery. It is possible, however, by an extension of the empirical method to increase very greatly the validity and reliability of information questions.

In the preparation of a mental test to be given to freshmen of the University of Washington in the fall of 1921 the information test elements were selected from an original list of four hundred questions. A tentative trial of these questions showed that for various reasons many were unsuitable and the number was finally reduced to two hundred thirty. These two hundred thirty questions were drawn from various sources. Sixty were adapted from Whipple's test of general information. Some forty were selected from Alpha forms. The remaining questions were largely original. The two hundred thirty questions in mimeographed form were given to 400 freshmen members of a class in general psychology. Not more than fifty questions were given in any single day and the students were requested to answer every question to the best of their ability even though the answer required guessing.

Three weeks before the information questions were answered the class had been given an examination of general mental ability of the "cycle" type. This examination which required thirty minutes of uninterrupted work contained eight conventional types of test adjusted to the mental level of college freshmen. It has somewhat greater validity and reliability than the Army Alpha with which it correlates, in the case of college freshmen, 0.78. The 320 members of the class who had answered all the information questions and had also taken the mental test were divided into quartiles on the basis of mental test score. The per cent of each quartile answering each information question correctly was then determined.

The discriminative value of the separate questions can be shown in various ways. If it is desired to obtain a set of questions which will show a high correlation with a test of intelligence a good measure of the value of a question is the cumulative total of the difference in per cent of students in the various quartiles answering it correctly. After a number of trials it was decided to give to each question a numerical value which was the difference in per cent of students in the first and fourth quartiles answering the questions correctly plus the difference in per cent of students in the second and third quartiles answering the questions correctly. Thus a question answered correctly by 20, 35, 45, and 65 per cent of the respective quartiles would have a value of 45 plus 10 equals 55. If the purpose of the test is to set off sharply those of inferior intelligence, those questions will be selected which show a large step between the lowest and the next quartile, decile, or other unit. Questions dividing the group in any other way desired can be similarly selected. This is the method used by the perfectors of trade tests.

In table 1 are shown the fifty best questions of the two hundred thirty evaluated. In table 2 is shown the per cent of each quartile answering each question correctly (when $\frac{1}{4}$ has been deducted for chance successes) and the difficulty in terms of S.D. with the range of ability assumed to be 2.5 S.D. The column headed "value" shows the sum of the differences between quartiles by the method already described.

With the results of an actual try-out before one it is often easy to see why a question has no value as a measure of intelligence. Many questions are so easy that even the least intelligent answer them correctly and thus the group is not distributed. A typical question of this group is, "The watt is a measure of HEAT SOUND ELECTRICITY HUMIDITY." Ninety-eight per cent of the highest quartile and 92 per cent of the lowest answered it correctly. One of the truisms of testing is that questions should not be too easy. Who, however, would

TABLE 1

The forty best questions

1. Samuel Clemens was a CRITIC HUMORIST ARTIST STATESMAN
2. "The Makings of a Nation" is an advertisement of a TOBACCO FLOUR BAKING POWDER HEALTH FOOD
3. A "Bohemian" is DISHONEST UNCONVENTIONAL EARNEST MUSICAL
4. "The Autocrat of the Breakfast Table" was written by HOLMES POE IRVING LONGFELLOW
5. Delphi is known for its WELLS TEMPLES ORACLE VASES
6. Romulus was a mythical king of PERSIA GREECE ASSYRIA ROME
7. The term gambit is used in CHESS TANNING PUTTEES HUMOR
8. Saturn was a god of the EGYPTIANS KELTS ROMANS GREEKS
9. A midiron is used in HOCKEY GOLF CRICKET WAR
10. "Paul Revere's Ride" was written by EMERSON BRYANT LONGFELLOW HOLMES
11. An ideally perfect commonwealth is called a REPUBLIC UTOPIA MONARCHY COMMUNE
12. *Walt* Whitman wrote MUSIC DRAMA *ART CRITICISM* FREE VERSE
13. The formula for common salt is $NaCl$ H_2SO_4 H_2O MnO_2
14. The blowing up of the Maine occurred in 1900 1889 1898 1897
15. Bancroft was a POET HISTORIAN DRAMATIST LECTURER
16. Among the amphibians are SNAKES FROGS FISHES MAMMALS
17. John Wesley was most famous in LITERATURE SCIENCE WAR POLITICS
18. An entree may be a ROAST DESSERT BEVERAGE APERTURE
19. *The author of "The Scarlet Letter" is HAWTHORNE POE STEVENSON* KIPLING
20. Aniline Dyes are obtained from FLOWERS INSECTS COAL TAR SEAWEEDS
21. Alexander the Great was a ruler in FRANCE ROME GREECE DENMARK
22. The Bastile was in LONDON PARIS ROME VIENNA
23. Puer means BOY SHAME CLEAR LOVELINESS
24. A substance that is not ordinarily a gas is NITROGEN CHLORINE CARBON HYDROGEN
25. *The chameleon is a BIRD REPTILE INSECT FISH*
26. Eugene Field is noted for his CHILDREN'S POEMS ESSAYS SONGS RIDDLES
27. Amy Lowell is best known as an ACTRESS PAINTER SOCIAL WORKER POET
28. Millet is famous in PHILOSOPHY MUSIC ART LITERATURE
29. Pasteur discovered a process of PRINTING STERILIZATION BLASTING MINING

TABLE I—*Continued.*

30. Papyrus was used for SMOKING WRITING EATING FUEL
31. Braillé refers to ACCOUSTICS RAISED WRITING WEAVING CALCULUS
32. Malthus' Law concerns POPULATION COINAGE TARIFF SHIPPING
33. The Corona is a kind of PHONOGRAPH MULTIGRAPH ADDING MACHINE TYPEWRITER
34. The agora was a MARKET PLACE SIREN BUILDING FABLE
35. Atilla was FRENCH AFRICAN HUN ENGLISH
36. Darwin was most famous in LITERATURE SCIENCE WAR POLITICS
37. Falstaff appears in ROMOLA VANITY FAIR OLIVER TWIST HENRY IV
38. Buccaneers were PIRATES EXPLORERS SPIES DIPLOMATS
39. An epigram is usually TEDIOUS INVOLVED BRIEF AMBIGUOUS
40. Addison was a DRAMATIST POET ESSAYIST NOVELIST

TABLE II.

Twenty-five typical poor questions

1. The original free verse writer was MAX EASTMAN H. L. MENCKEN AMY LOWELL WALT WHITMAN
2. The messenger of the gods was VULCAN HERMES PAN DIONYSUS
3. Portugal is a MONARCHY REPUBLIC DEMOCRACY OLIGARCHY
4. Rococo means COBBLED SIMPLE TRIPPING FLORID
5. The hemiptera are WORMS INSECTS BIRDS FISHES
6. Glycogen is stored in the HEART LUNGS THYROID LIVER
7. Chlorine is an OBLONG MANTLE DYE ELEMENT ANESTHETIC
8. Amphioxos is a LANCELET FROG ANNULATE MAMMAL
9. The Suez Canal was built by FRANCE SPAIN GERMANY ENGLAND
10. The howitzer is a kind of MACHINE-GUN RIFLE CANNON PISTOL
11. 1827 is the date of the first TELEPHONE STEAMBOAT RAILROAD CANAL
12. "The Gold Bug" is an IDYL EPIC LYRIC SHORT STORY
13. Ohm's law is used in HEAT ELECTRICITY LIGHT SOUND
14. Nox was the goddess of LIGHT LOVE DARKNESS BEAUTY
15. Medes refers to RELICS INSTITUTIONS GODS NATION
16. Enzymes are found in the NERVES STOMACH BLOOD BONES
17. A vertebra is a section of the LEG BONE MUSCLE SPINE
18. The number of teeth in an adult is 32 30 28 34
19. The early Egyptians disposed of their dead by BURNING EMBALMING BURIAL EXPOSURE
20. A whale is classified as a FISH MAMMAL REPTILE AMPHIBIA
21. The Delco System is used in PLUMBING FILING IGNITION CATALOGUING
22. Aggassiz was an EXPLORER NATURALIST DIVINE SOLDIER
23. Clemenceau is an INVENTOR POET SOLDIER STATESMAN
24. Silk comes from a kind of CRAB WORM BEETLE PLANT
25. To set fire to a house is called LARCENY INCEST MAYHEM ARSON

TABLE 3

The per cent of each quartile answering each of the forty best questions correctly, the final value assigned, and the difficulty of the question

QUESTION	Q1	Q2	Q3	Q4	VALUE	S.D.
1	63	56	36	21	62	51.5
2	37	22	10	−5	54	59.5
3	58	49	27	26	54	52.5
4	66	40	37	12	53	52
5	62	50	38	21	53	52
6	50	80	43	44	52	48.5
7	30	28	6	2	50	59
8	40	21	8	6	47	59
9	49	44	31	12	47	54
10	44	53	30	21	46	52.5
11	49	45	35	14	45	53.5
12	73	70	58	41	44	65.5
13	72	50	51	33	44	49
14	49	34	16	12	43	55.5
15	58	50	34	31	43	51.5
16	43	27	16	12	42	57
17	51	48	36	22	41	52.5
18	51	28	30	8	41	55.5
19	52	53	36	20	40	52
20	35	35	29	2	39	56.5
21	44	39	19	26	38	54.5
22	64	64	54	36	38	48.5
23	44	30	24	12	38	56
24	61	56	47	33	37	50
25	41	32	17	20	36	56
26	59	61	57	29	34	49.5
27	33	30	17	13	33	57.5
28	39	31	33	4	33	56
29	70	57	51	44	32	48.5
30	75	72	59	56	32	46
31	35	23	12	14	32	58
32	26	21	23	−8	32	60
33	66	68	55	48	31	47.5
34	28	21	2	17	30	59.5
35	59	27	26	30	30	54.5
36	71	67	65	43	30	47
37	28	18	14	2	30	59
38	71	63	54	50	30	47
39	61	52	44	39	30	50
40	47	47	37	27	30	52.5

have said in advance that 98 per cent of freshmen would mark the correct answer in "Fulton's Folly" was the name of a BOOK AIRPLANE STEAMBOAT COTTON GIN" (this before the widely attended moving picture) and only 41 per cent mark correctly "The Makings of a Nation is an advertisement of a TOBACCO FLOUR BAKING POWDER HEALTH FOOD" when the answer stares at them from every bill board? This last question, surprisingly or not, was the second best of the entire list. Among questions so difficult that even the upper quartile

TABLE 4

The per cent of each quartile answering each of the twenty-five poorest questions correctly, the final value assigned, and the difficulty of the question

QUESTION	Q1	Q2	Q3	Q4	VALUE	S.D.
1	−3	10	24	21	−32	60.5
2	10	31	19	14	28	56
3	21	23	21	44	−21	67.6
4	2	4	4	4	−2	68.5
5	17	15	24	10	−8	50
6	4	19	14	10	−1	62
7	39	35	40	49	−5	50.5
8	−20	−16	−18	−14	−4	
9	71	72	74	−71	−2	44
10	37	27	33	32	−1	54.5
11	9	6	12	11	−8	63
12	53	67	72	53	−5	47
13	53	48	49	55	−3	49.5
14	10	14	19	15	−10	60.5
15	19	10	47	0	−9	58
16	30	15	22	24	−1	57.5
17	73	68	73	70	−2	44.5
18	62	64	44	50	8	52
19	66	66	63	64	5	46.5
20	48	27	40	33	2	53.5
21	48	47	44	44	7	51
22	13	15	11	13	4	61
23	74	66	69	66	5	45
24	75	75	74	69	7	43.5
25	32	30	37	29	5	54

gave only the approximate chance score were those asking the location of the Pantheon and the battle of Waterloo, the nature of a soviet, the authorship of the "Rise of the Dutch Republic" and the nature of asteroids and of catalepsy.

Since test elements are often evaluated one year for use the next, it becomes desirable to know the stability of questions from year to year. Fifty of the two hundred thirty information questions used in this study were given to classes in psychology under similar conditions in successive years. In the intelligence test given to all freshmen students the mean score for the entering class of 1922 was 59.2 and for the class entering in 1923, 59.4 points. The dispersion of scores for the two classes was the same. The mean difficulty of the fifty information questions was 51.2 for the class of 1922 and 51.4 for the class of 1923. The mean value of the questions as measured by the cumulative totals of differences between quartiles was 18.0 for each class. The average deviation of the differences in difficulty of the questions was 3.7. The average deviation of the cumulative difference between quartiles was 3.0. The value of the questions is seen to be rather more variable than their reliability. However, 17 of the 20 best questions selected with the 1922 class hold their rank among the best 20 with the entering class of 1923. Although the successive freshmen classes had given almost identical scores in every trait measured the high stability of the information questions was something of a surprise. Whether or not the results found here are typical can be shown only by comparisons extending over a number of years.

In the absence of actual trial there is no justification for the assertion that questions found valuable at the University of Washington will have even approximately the same value when given to students in other localities. It is highly probable that in spite of the educational and cultural uniformity of the United States there are large local differences in the kinds of information possessed by college freshmen. These differences could be brought out in an interesting fashion if the various departments that have given the Army Alpha test to their students would re-score the papers of those who attempted every question in Test 8 and announce the per cent of correct answers given on each test element.

CONCLUSIONS

1. The empirical method should be extended to include each element in an information test.

2. It is impossible to determine with accuracy the value of an information question by inspection alone.

3. The stability of difficulty and distributing value of information questions is sufficiently large so that questions can be evaluated one year for use the next.

VALIDITY OF CHARACTER JUDGMENTS BASED ON EXTERNAL CRITERIA

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INTRODUCTION

Industry, fully aware of the advantage of an accurate and dependable means of estimating men and women, gives ear to any method of judging character which is at all plausible and which is earnestly presented. At the present time many so-called character analysts, consultants, and experts are presenting both plausibly and earnestly methods of judging character based on physical criteria, such as head measurements. Respectable psychology almost without exception repudiates such methods and its foundations on physiological and neurological grounds. The futility of character judgments by any form of phrenology is refuted *theoretically* to the queen's taste in a conclusive onslaught by Knight Dunlap in an article published in *The Scientific Monthly,* vol. XV, no. 2, August, 1922.

But business uses phrenological methods of character judgment rather freely and with some satisfaction. Science and psychology for their own purposes need only theoretical refutation. Business evidently is not sufficiently impressed with theory. Perhaps statistical refutation will help in this connection and round out even the academic treatment of phrenology. This study furnishes such statistical refutation.

THE METHOD OF THE PRESENT STUDY

First: Systems of character judgments by external signs were searched to find definite physical traits varying amounts of which are claimed to indicate varying amounts of some character trait. Measurement of such physical traits were made.

Second: Groups of individuals were judged *casually* for specific character traits. There is a possibility that character may be judged by external signs and then the wrong signs reported. That is, by intuition true judgment may be made but the judges are unaware of how judgments are made; and so very naturally report some method.

Third: Close associates who knew the characters of the members of each group carefully rated the members of each group to establish the facts relative to the varying amounts of certain traits possessed by members of each group.

Fourth: The three measurements were correlated.

GENERAL CONCLUSION

For the busy reader the following sentence contains the meat of this statistical refutation of methods of character judgments by external criteria. The average of 201 correlations between variations in physical traits purported to reveal variations in character traits and our criteria was 0.000 with the correlations varying from 0.000 as chance would account for.

Statistically: In a normal distribution 50 per cent of the cases come within 1 P.E.; 51.24 per cent of the correlations between physical traits and character traits came within 1 P.E. In a normal distribution 82.26 per cent of the cases fall within 2 P.E. Of the 201 correlations reported here 83.08 per cent of them come within 2 P.E. In a normal distribution 95.70 per cent of the cases come within 3 P.E. In this study 98.01 per cent of the correlations come within 3 P.E. In a normal distribution 99.30 per cent of the cases fall within 4 P.E. One hundred per cent of the correlations in this study fall within 4 P.E. Statistically then the correlation between variations in physical traits and character traits *is* 0.000 (within the reliability of our data).

CHARACTER TRAITS STUDIED

The following character traits were the ones used in this study.

Sound Judgment
Intellectual Capacity
Frankness
Will Power
Ability to Make Friends
Leadership
Originality
Impulsiveness

These traits were used primarily because a study of the literature of both modern and historic phrenology revealed great disagreement among the doctors as to just what various physical symptoms really indicate. There was less disagreement among the phrenologists on these traits than upon others.

It is noteworthy that when allowances for form of statement due to a growing language are made the writings on character analysis of the present day are practically the same as they were one hundred and twenty years ago and strikingly similar to the pronouncements of the employment consultant Theophrastus of Eresos who lived 372 to 288 B.C.

THE MEASUREMENTS OF PHYSICAL TRAITS

Since absolutely accurate and tested anthropometric instruments seemed to avoid an error of about 1 mm. the slightly additional reliability of such instruments was not considered necessary. Character analysts use their eyes. We used instruments which must have made our measure at the worst far more accurate than theirs at the best. Our kit contained

(a) Standard spreading calipers
(b) Sliding compass
(c) Steel tape
(d) Head square—constructed for the purpose upon the principle of the multiple sliding compass to facilitate measurements of distances from the meatus to various sections of the cranium.

The following are samples of the measurements made and correlated against our criteria. The basis for the selection of these measurements was the fact that, in one or more of the many authoritative accounts of character analysis, these measurements were purported to measure some trait under study. In many instances the measure used was explicitly stated to reveal the character trait study. In some instances inference from rather vague assertions had to be made.

It is needless to repeat here the lists of physical factors used in connection with all the character traits studied. In testing the hypothesis that certain physical factors indicated Will Power 36 physical factors were measured. In testing the hypothesis that certain physical factors indicated Friend Making Ability 13 physical factors were measured. In testing the hypothesis that certain physical factors indicated the trait Leadership 30 factors were measured. For the trait Originality 23 factors were studied. For the trait Impulsiveness 20 physical factors purporting to indicate this trait were used in this study.

SUBJECTS OF THE STUDY

Neglecting certain preliminary work the study was based on three groups, 10 in each. Two of these groups were members of two national sororities. The other group were members of a national fraternity. The main reason for using members of close social organizations was the fact that judgments of the several aspects of their character could be obtained. Each member of all our groups could be rated by a much larger group of judges who knew intimately not only the individual subject rated but also every other member of his group. In this way a man to man rating could be set up and many of the pit-falls of ratings overcome.

THE RELIABILITY OF THE RATINGS

The ratings of the close associates. These ratings were used as the criteria of the character traits. The reliabilities of these

TABLE I

Outline of factors used in the study of trait judgment

Hypotheses: That judgment is indicated by the following physical factors:

- A. Large cranial development
  - Measured by:
    - (1) Circumference—anterior inferior to posterior central
    - (2) Circumference plus height of head from meatus vertical
    - (3) Length of head—glabella to occipital protuberance plus height plus maximum breadth
- B. High development of anterior lateral region
    - (4) Width of head at temples
- C. High development of upper part of forehead
    - (5) Breadth frontal eminences
    - (6) Length from meatus to anterior superior
    - (7) Length from meatus to anterior superior plus breadth of frontal eminences
- D. High development of the entire anterior region
    - (8) Average breadth of forehead
    - (9) Average length from meatus to anterior regions
    - (10) Average breadth of forehead plus average length from meatus to anterior regions
    - (11) Average breadth of forehead plus length meatus to anterior regions plus height of head
    - (12) Ratio—Anterior length of head : posterior length of head—measured from meatus
    - (13) Ratio—Anterior inferior length : posterior central length—measured from meatus
    - (14) Ratio—anterior superior length : posterior central length—measured from meatus
- E. Wide head
    - (15) Maximum breadth of head
    - (16) Cephalic index
    - (17) Breadth divided by height index
    - (18) Breadth divided by (height plus length) index
- F. Great breadth between eyes
    - (19) Eye to eye center
- G. Arched nose
    - (20) Average length from meatus to root and tip of nose subtracted from length meatus to bridge of nose
- H. Small eyes
    - (21) Eye opening vertical (inverse)
    - (22) Breadth of eyes horizontal (inverse)
    - (23) Vertical opening of eyes plus breadth (inverse)

TABLE 1—*Continued*

I. Broad blunt facial features
    (24) Average breadth of nose
    (25) Breadth of mouth
    (26) Breadth of chin
    (27) Breadth of nose plus breadth of mouth plus breadth of chin
J. Vertical forehead profile
    (28) Length meatus to anterior superior less length meatus to anterior inferior

TABLE 2

Outline of factors used in the study of trait intelligence

Hypotheses: That intelligence is indicated by the following physical factors:
A. Large cranial development
  Measured by:
    (1) Circumference—anterior inferior to posterior central
    (2) Circumference plus height of head from meatus vertical
    (3) Length of head—glabella to occipital protuberance plus height plus maximum breadth
B. Large ratio head development to body
    (4) Circumference—anterior inferior to posterior central divided by weight
    (5) Circumference plus height of head divided by weight
    (6) Height plus breadth plus length of head divided by weight
C. Wide forehead
    (7) Average width of forehead
D. Prominent anterior superior region
    (8) Breadth frontal eminences
    (9) Length from meatus to anterior superior
    (10) Length from meatus to anterior superior plus breadth of frontal eminences
E. Prominent anterior lateral region
    (11) Breadth of head at temples
F. High head
    (12) Height meatus to top of head
    (13) Height divided by length index
    (14) Height divided by breadth index
    (15) Height divided by (breadth plus length) index

TABLE 2—*Continued.*

G. Great length from ears forward
  (16) Meatus to anterior inferior
  (17) Ratio—average anterior length : average posterior length of head
  (18) Ratio—anterior inferior length : posterior central length—measured from meatus
H. Great breadth between eyes
  (19) Eye to eye center
I. Small eyes
  (20) Eye opening verticle (inverse)
  (21) Breadth of eyes horizontal (inverse)
  (22) Vertical opening of eyes plus breadth (inverse)
J. Large facial features
  (23) Average breadth of nose
  (24) Breadth of mouth
  (25) Breadth of chin
  (26) Length plus height of nose
  (27) Breadth of nose plus breadth of mouth plus breadth of chin
K. Long nose
  (28) Length of nose
L. Straight nose
  (29) Average length from meatus to root and tip of nose subtracted from length meatus to bridge of nose

TABLE 3

Reliability of ratings of close associates

Ratings of first half (10 close associates) taken in chance order correlated with ratings of second half (10 close associates) taken in chance order

TRAIT	GROUP W (10 CASES)	P.E.	GROUP X (9 CASES)	P.E.	GROUP Y (9 CASES)	P.E.	AVERAGE
Judgment	0.92	0.032	0.97	0.013	0.96	0.017	0.950
Intelligence	0.92	0.032	0.79	0.084	0.83	0.070	0.846
Frankness	0.33	0.190	0.68	0.120	0.79	0.084	0.600
Will Power	0.83	0.064	0.78	0.087	0.96	0.016	0.856
Ability to Make Friends	0.73	0.095	0.41	0.186	0.75	0.098	0.630
Leadership	0.78	0.084	0.87	0.054	0.83	0.070	0.826
Originality	0.81	0.072	0.71	0.111	0.80	0.081	0.773
Impulsiveness	0.61	0.133	0.93	0.030	0.78	0.087	0.773

ratings were obtained by correlating half of the judgments against the other half for the ratings of each trait. The self correlations are reported in table 3.

Groups W, X and Y are the three groups keyed for obvious reasons.

HALO IN RATINGS BY CLOSE ASSOCIATES

In order to determine the probable amount of halo effect in these analyzed ratings the inter-correlations between all the traits were computed. We do not know what the inter-correlations actually are. However if all the inter-correlations were 1.00 we would be certain that all that had been obtained was a general estimate under many different names. Space will not permit the insertion here of all the tables of inter-correlations. One table (table 4) is inserted. This table is typical of all the others rendered by the close associates.

TABLE 4

Inter-correlation of trait judgment with the remaining seven traits

	GROUP W	P.E.	GROUP X	P.E.	GROUP Y	P.E.	AVERAGE
Intelligence	0.89	0.045	0.60	0.117	0.91	0.030	0.830
Frankness	0.71	0.106	0.58	0.148	0.93	0.030	0.740
Will Power	0.68	0.113	0.91	0.039	0.96	0.017	0.853
Ability to Make Friends	0.76	0.090	0.55	0.157	0.83	0.070	0.713
Leadership	0.91	0.034	0.98	0.008	0.91	0.030	0.933
Originality	0.69	0.111	0.50	0.169	0.59	0.140	0.593
Impulsiveness	−0.42	0.175	0.17	0.218	−0.22	0.215	−0.156

The distribution of all the inter-correlations of ratings of close associates is given in table 5.

We have then very reliable ratings of three groups. Each group was rated by men or women who live in the closest association with the subjects studied. *They* presumably know the subjects studied. Over-estimation was avoided by the man to man method of rating. The inter-correlation between traits are on the whole reasonable. The number of judges used in rating each group was twenty.

TABLE 5

Average inter-correlation of traits—ratings of close associates

A. *Average inter-correlation 0.85 to 1.00*
  1. Judgment and Will Power
  2. Judgment and Leadership
  3. Will Power and Leadership

B. Average inter-correlation 0.55 to 0.84
  1. Judgment and Intelligence
  2. Judgment and Frankness
  3. Judgment and Ability to Make Friends
  4. Judgment and Originality
  5. Intelligence and Frankness
  6. Intelligence and Will Power
  7. Intelligence and Ability to Make Friends
  8. Intelligence and Leadership
  9. Intelligence and Originality
  10. Frankness and Will Power
  11. Frankness and Ability to Make Friends
  12. Frankness and Leadership
  13. Frankness and Originality
  14. Will Power and Ability to Make Friends
  15. Leadership and Originality
  16. Leadership and Ability to Make Friends

C. Average inter-correlation 0.35 to 0.54
  1. Will Power and Originality
  2. Ability to Make Friends and Originality
  3. Originality and Impulsiveness

D. *Average inter-correlation below 0.35*
  1. Judgment and Impulsiveness
  2. Intelligence and Impulsiveness
  3. Frankness and Impulsiveness
  4. Will Power and Impulsiveness
  5. Ability to Make Friends and Impulsiveness
  6. Leadership and Impulsiveness

THE RELIABILITY OF RATINGS BY CASUAL OBSERVERS

Each of the three groups which were rated by their close associates and members of which were character analyzed were also rated by casual observers. The procedure was as follows: Each group in turn were seated upon a stage and seventy judges rated them for the eight traits used in this study. The casual observers were composed of business men, school superintendents and students of personnel management. Most of the group were accustomed to judging men and women with possible employment in view. As far as could be learned none of these judges used any "system" of judgment consciously. Each group remained on the stage long enough for even the satisfaction of the most deliberate judge. The ratings thus obtained were divided into two groups and the self-correlation of the ratings obtained. These are our measure of the reliability of casual observation. Table 6 reports the correlations thus obtained.

TABLE 6

Reliability of ratings of casual observers

Ratings of first half (35 observers) taken in chance order correlated with ratings of second half (35 observers) taken in chance order

TRAIT	GROUP W (10 CASES)	P.E.	GROUP X (10 CASES)	P.E.	GROUP Y (10 CASES)	P.E.	AVERAGE
Judgment	0.88	0.048	0.98	0.008	0.92	0.019	0.926
Intelligence	0.91	0.034	0.96	0.016	0.90	0.041	0.923
Frankness	0.51	0.157	0.96	0.016	0.74	0.093	0.736
Will Power	0.99	0.004	0.96	0.016	0.95	0.021	0.966
Ability to Make Friends	0.87	0.050	0.90	0.041	0.89	0.045	0.886
Leadership	0.73	0.090	0.88	0.051	0.79	0.081	0.800
Originality	0.62	0.130	0.95	0.021	0.78	0.084	0.783
Impulsiveness	0.78	0.084	0.99	0.004	0.86	0.055	0.876

It is noteworthy that casual observation right or wrong is nevertheless fairly consistent. Whatever physical signs go to impress a casual observer seems similarly to impress other casual observers. The two traits that casual observers have the least agreement about are frankness and originality.

HALO IN RATINGS BY CASUAL OBSERVERS

It was also desirable to compute the inter-correlations between the several traits as judged by casual observers. Table 7 reports the inter-correlations between the trait judgment and the other traits. It is fairly typical of all the inter-correlations.

The summary of all the inter-correlations between traits as judged by casual observation is contained in table 8.

TABLE 7

Inter-correlation of trait judgment with the remaining seven traits

Ratings of casual observers

TRAIT	GROUP W (10 CASES)	P.E.	GROUP X (10 CASES)	P.E.	GROUP Y (10 CASES)	P.E.	AVERAGE
Intelligence	0.94	0.025	0.87	0.050	0.90	0.041	0.903
Frankness	0.25	0.190	0.73	0.099	0.38	0.182	0.453
Will Power	0.85	0.059	0.82	0.067	0.93	0.020	0.806
Ability to Make Friends	0.32	0.191	0.65	0.122	0.35	0.187	0.440
Leadership	0.64	0.125	0.83	0.069	0.62	0.130	0.696
Originality	0.86	0.055	0.16	0.208	0.87	0.050	0.630
Impulsiveness	0.32	0.191	−0.35	0.187	0.44	0.172	0.136

TABLE 8

Average inter-correlation of traits—ratings of casual observers

A. Average inter-correlation 0.85 to 1.00 (P.E. 0.059 to 0)
   1. Judgment and Intelligence
   2. Judgment and Will Power

B. Average inter-correlation 0.55 to 0.84 (P.E. 0.149 to 0.062)
   1. *Judgment and Leadership*
   2. Judgment and Originality
   3. Intelligence and Will Power
   4. Intelligence and Leadership
   5. Intelligence and Originality
   6. Will Power and Leadership
   7. Will Power and Originality
   8. Leadership and Originality

C. Average inter-correlation 0.35 to 0.54 (P.E. 0.220 to 0.188)
   1. Judgment and Frankness
   2. Judgment and Ability to Make Friends
   3. Intelligence and Ability to Make Friends
   4. Frankness and Intelligence
   5. Frankness and Ability to Make Friends
   6. Impulsiveness and Ability to Make Friends

D. Average inter-correlation 0.04 to 0.34 (P.E. 0.220 to 0.188)
   1. Judgment and Impulsiveness
   2. Intelligence and Impulsiveness
   3. Frankness and Will Power
   4. Frankness and Leadership
   5. Frankness and Originality
   6. Will Power and Ability to Make Friends
   7. Will Power and Impulsiveness
   8. Ability to Make Friends and Leadership
   9. Ability to Make Friends and Originality
   10. Leadership and Impulsiveness
   11. Originality and Impulsiveness
   12. Impulsiveness and Frankness

TABLE 9

Inter-correlations—physical factors—trait judgment

Spearman rank method—28 cases

FACTOR	A-2	A-3	C-7	D-12	E-15	E-18	G-20	H-23	I-27	J-28
A-2		0.86	0.37	0.48	0.32	−0.07	−0.50	−0.64	−0.65	−0.20
A-3	0.86		0.40	0.42	0.57	0.12	−0.29	−0.70	0.42	0.06
C-7	0.37	0.40		0.32	0.45	0.57	−0.09	−0.66	−0.19	0.02
D-12	0.48	0.42	0.32		0.71	0.53	0.08	−0.40	0.35	−0.20
E-15	0.32	0.57	0.45	0.71		0.67	0.08	−0.53	0.50	−0.48
E-18	−0.07	0.12	0.57	0.53	0.67		0.15	−0.44	0.06	−0.39
G-20	−0.50	−0.29	−0.09	0.08	0.08	0.15		0.26	−0.11	0.14
H-23	−0.64	−0.70	−0.66	−0.40	−0.53	−0.44	0.26		0.02	−0.06
I-27	−0.65	0.42	−0.19	0.35	0.50	0.06	−0.11	0.02		−0.56
J-28	−0.20	0.06	0.02	−0.20	−0.48	−0.39	0.14	−0.06	−0.56	
Mean.....	−0.003	0.215	0.132	0.255	0.255	0.122	−0.031	−0.350	−0.017	−0.185

TABLE 10

Mean inter-correlations 10 specific physical traits with 28 specific physical traits

Spearman rank method—28 cases

TRAIT	A-1	A-2	A-3	B-4	C-5	C-6	C-7	D-8	D-9	D-10	(21)
Mean inter-correlation with 28 traits..........	0.297	0.111	0.255	0.190	0.133	0.105	0.199	0.242	0.240	0.266	

THE RELIABILITY OF MEASUREMENTS BY EXTERNAL SIGNS

It will be remembered that the reliability of judgments by close associates and even by casual observers using no particular "system" was high. It will be useful to know that the reliability of judgments based upon the "authoritative" physical measurements possess no such agreement. When a group is measured for those physical factors purported to reveal judgment we find that the measures do not agree among themselves. Table 9 shows the inter-correlations between ten physical factors *supposed to measure the same trait. This is typical* of the agreement between other physical measures purporting to measure the same trait.

No better agreement is found when we find the inter-correlations of the total 28 factors used in measuring Judgment, as table 10 shows.

CORRELATIONS BETWEEN RATINGS OF CLOSE ASSOCIATES AND PHYSICAL FACTORS

In correlating the measures of character gained from physical measurements with those obtained from the judgments of close associates two methods were used throughout this study. First the correlation between the two types of character estimate was computed for each of the three groups. Second the members of each group were thrown into one array as follows. *Each rating was changed to a standard measure and thus the* scores of all the groups become comparable. The formula for transferring ratings of any one group to scores for a total group was

$$\frac{\text{Score} - \text{true mean}}{\text{Standard deviation}} = \text{standard measure}$$

In this way 28 cases could be studied at once.

Further in view of the fact that the different factors purporting to measure any given character trait correlated so poorly with each other that it would be impossible to build up a *one best measure* of any trait we have correlated each separate physical

TABLE 11

Correlations existing between ratings of close associates and physical factors

Pearson product-moment method trait judgment

PHYSICAL FACTOR	STANDARD MEASURES (28 CASES)	P.E.	GROUP W (10 CASES)	P.E.	GROUP X (9 CASES)	P.E.	GROUP Y (9 CASES)	P.E.
A-1	−0.04	0.127	0.32	0.191	−0.24	0.213	−0.38	0.192
A-2	−0.10	0.126	0.53	0.153	−0.21	0.216	−0.31	0.203
A-3	−0.12	0.125	0.06	0.217	−0.29	0.206	−0.34	0.198
B-4	0.21	0.121	0.02	0.221	0.23	0.214	0.52	0.164
C-5	−0.06	0.127	−0.32	0.101	−0.02	0.225	0.02	0.225
C-6	−0.04	0.127	0.34	0.188	0.22	0.215	0.26	0.210
C-7	0.08	0.126	−0.30	0.180	−0.13	0.220	0.32	0.201
D-8		0.127	−0.06	0.217	0.04	0.224	0.23	0.214
D-9	0.06	0.127	0.55	0.149	−0.27	0.209	0.37	0.193
D-10	0.05	0.127	0.04	0.220	−0.08	0.223	0.63	0.135
D-11	−0.04	0.127	0.03	0.221	−0.28	0.207	0.01	0.225
D-12	0.29	0.116	0.38	0.182	0.23	0.214	0.69	0.117
D-13	0.38	0.108	0.52	0.155	−0.09	0.221	0.74	0.101
D-14	0.31	0.115	0.30	0.185	0.33	0.200	0.65	0.129
E-15	0.09	0.126	0.15	0.209	−0.10	0.222	−0.21	0.216
E-16	−0.09	0.126	−0.18	0.207	−0.04	0.224	−0.32	0.201
E-17	0.00	0.127	−0.59	0.139	0.29	0.206	0.34	0.198
E-18	−0.01	0.127	−0.29	0.195	0.23	0.214	0.20	0.216
F-19	−0.14	0.125	0.23	0.202	−0.53	0.161	−0.21	0.216
G-20	0.03	0.127	0.16	0.208	0.02	0.225	0.08	0.223
H-21	0.06	0.127	0.37	0.183	0.14	0.220	0.02	0.225
H-22	−0.07	0.127	0.00	0.222	−0.30	0.204	−0.33	0.200
H-23	−0.04	0.127	0.15	0.200	−0.22	0.215	0.04	0.224
I-24	−0.27	0.118	−0.18	0.207	−0.22	0.215	0.43	0.182
I-25	−0.34	0.112	0.09	0.213	−0.57	0.151	−0.46	0.177
I-26	−0.07	0.127	0.54	0.151	−0.58	0.148	0.04	0.224
I-27	−0.12	0.125	0.32	0.191	−0.78	0.087	−0.04	0.224
J-28	−0.20	0.122	−0.18	0.207	0.33	0.200	−0.22	0.215
Average...	−0.005							

measurement with the ratings by close associates. Since many physical measures might be false yet some *might* be true. It will be too prodigal of space to report all of these correlations for every trait studied. Table 11 is a full report of the correlations for one character trait. In further instances averages alone will be reported.

AVERAGE CORRELATIONS BETWEEN RATINGS BY CLOSE ASSOCIATES AND PHYSICAL FACTORS FOR EIGHT TRAITS

It is unnecessary to report all the correlations between the ratings by close associates for a given trait and the many physical factors purporting to reveal that given trait. Table 12 reports the average correlation between ratings and the physical factors.

TABLE 12

Average correlations—physical factors and close associates; physical factors and casual observers

TRAIT	CLOSE ASSOCIATES AND PHYSICAL *FACTORS*	CASUAL OBSERVERS AND PHYSICAL *FACTORS*
Judgment	−0.005	+0.145
Intelligence	+0.027	+0 051
Frankness	+0.055	+0.155
Friendliness	−0.11	+0.195
Will Power	−0.074	+0.036
Leadership	−0.041	+0.066
Originality	+0.095	+0.079
Impulsiveness	+0.100	−0 067

The number of different physical factors used varied from 36 for Will Power to 13 for Ability to Make Friends.

THE AGREEMENT BETWEEN CLOSE AND CASUAL OBSERVERS

Table 13 gives correlations between close and casual observers.

CONCLUSION

While the correlations secured between the ratings of close associates and casual observers show a general positive tendency they are not of sufficient magnitude to warrant any importance being attached to them. The highest correlation secured is less than four times its probable error.

The highest average correlation presented is 0.323. Such a correlation measured on the basis of the standard error of estimate formula:

$$\text{Sigma} = 1 \times \sqrt{1 - r^2}$$

would have a value of 5.6 per cent better than chance. The highest single correlation secured was 0.58. Such is 18.6 per cent better than chance.

TABLE 13

Correlation existing between ratings of close associates and ratings of casual observers

TRAIT	GROUP W (10 CASES)	P.E.	GROUP X (9 CASES)	P.E.	GROUP Y (9 CASES)	P.E.	AVERAGE
Judgment	0.29	0.195	0.48	0.172	0.18	0.217	0.316
Intelligence	0.04	0.220	0.26	0.210	−0.23	0.214	0.023
Frankness	0.11	0.211	0.31	0.203	0.21	0.210	0.210
Will Power	0.02	0.221	0.58	0.148	0.19	0.217	0.263
Ability to Make Friends	0.53	0.153	0 31	0 203	−0.30	0.204	0.180
Leadership	0.40	0.179	0.08	0.223	0.40	0.177	0.313
Originality	0.43	0.174	0.47	0.175	0.07	0.223	0.323
Impulsiveness	0.33	0.189	0.37	0.193	−0.10	0.222	0.200

SUMMARY OF STUDY

This study was undertaken to supply statistical basis for the truth or falsity of the theory and practice of character analysis. Theoretical refutation already exists in ample amount. From the facts reported and treated in this study the following conclusions receive clear support.

1. The ratings of close associates are reliable.
2. The ratings of 70 casual observers are reliable.
3. The physical factors purporting to measure the same trait do not present even a suspicion of agreement.
4. The correlation between ratings of close associates and casual observers is slightly better than chance.
5. The correlation between ratings of casual observers and physical measurements is best represented by 0.000.

6. The correlation between close associates and physical measurements is best represented by 0.000.

7. Physical measurements which underly character analysis agree neither with themselves nor with other measures of character.

ADVERTISING APPEALS SELECTED BY THE METHOD OF DIRECT IMPRESSION[1]

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The "Order of Merit" method as used in ranking advertisements has so often been discussed by Hollingworth,[2] Strong,[3] Starch,[4] and others that a mere mention of it here should suffice. In the majority of cases where these authors have made use of this ranking method the number of advertisements have been limited to twenty or less; even when twenty advertisements were used it was thought so difficult to get a true order of merit directly that the subjects making the ranking were instructed first to separate the advertisements into groups, such as Very strong, Strong, Weak, Very weak, or otherwise, to facilitate ranking. The greater the number of advertisements the more difficult ranking them becomes, even with the help of separating them into groups. If one had, for example, about 1700 proposed drug signs 16 inches square to rank,—as was the case when Professor Woodworth and the writer tried to select a suitable sign for the Rexall Drug Company,—the task would become quite impossible. Thus some other method must necessarily be used if one has a great number of advertisements or other material upon which he desires to have scientific judgment passed.

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[1] The writer wishes to express his thanks and appreciation to Prof. Harry D. Kitson, University of Indiana, and his students for their kind coöperation, without which this paper would not have been possible.

[2] Harry L. Hollingworth, Advertising and selling, Chapter I.

[3] Edward K. Strong, Jr., The relative merit of advertisements, Archives of Psychology, no. 17, July, 1911.

[4] Daniel Starch, Advertising, Chapter XXII.

The prime purpose of this article is to illustrate and discuss a method: the "Method of Direct Impression"—which has been used by Galton[5] in measuring mental imagery; by Titchener[6] in studying the affective qualities of a series of colors; by Strong[7] in securing degrees of confidence in recognition of a series of advertisements; etc.—and to show how this method may be applied to selecting the best advertisements or sales appeals from among *any* number of potential appeals.

For the purpose in hand a number of hosiery advertisements were selected from some of the leading national magazines. Although in many cases such pictorial presentation as "beauty" in hosiery predominated the advertisement, only the printed copy of these advertisements was carefully analyzed, and 77 somewhat overlapping, selling points or phrases, such as "Silk stockings that wear," "Value for the price," etc., were mimeographed on sheets of paper and distributed to four groups of students (160 men and 75 women) taking a course in Psychology of Advertising at New York University Summer School (1922) and at the University of Indiana (1922). The students were directed to rate the sales points as follows: 0, very weak; 1, weak; 2, strong; 3, very strong. The mimeographed sheets containing the instructions and the 77 sales appeals are reproduced herewith.

Each statement represents a possible selling point or advertising appeal for hosiery. Please mark all of these according to the degree in which they *appeal to you personally, persuade you*, or *interest you* in the *product, as follows:*

Mark very strong—3	Sex........................
Mark strong—2	Name......................
Mark weak—1	Class......................
Mark very weak—0	Date.......................

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[5] Francis Galton, Inquiries into human faculty and its development, pp. 57 to 77.

[6] Edward B. Titchener, Experimental psychology, vol. I, pp. 154–8.

[7] Edward K. Strong, Jr., The Psychological Review, vol. XIX, no. 6, November, 1912.

ANALYSIS OF ARGUMENTS FOR HOSIERY

1. The best of service.
2. Made of tested combed yarn.
3. Specially dyed.
4. Finished to retain the yarn in its greatest natural strength.
5. Reinforced heels and toes.
6. Specially constructed to guarantee long wear.
7. Maintain original high quality.
8. Don't speculate with the money you invest in silk stockings.
9. There is a certain satisfying value.
10. They're garter proof. "No run that starts above can pass the gold stripe."
11. Silk stockings that wear.
12. Good as they look.
13. You get what you pay for.
14. Washing won't hurt them (don't get a cheap silk—it goes in the first wash).
15. Be sure you get fresh stock when buying silk hose (new shipments just arrived in all desirable colors).
16. All the qualifications of a guaranteed hose at half the price.
17. Quality first.
18. Don't wear out as quickly.
19. Value for the price.
20. Long staple yarn.
21. Single sole with triple heel and toe.
22. Prolong the life by changing daily or oftener for summer. Change your socks and your *shoes*—it's a very restful thing to do.
23. Full fashion fits shape of the foot.
24. Do not hang baggy.
25. No seam to chafe or rub the skin.
26. Snug fit prevents chaffing the feet.
27. Fit like a glove.
28. Tested for strength.
29. Strong threads.
30. Absolute fast colors guaranteed (new pair or your money back).
31. Guaranteed 6 months.
32. Guaranteed to give satisfaction.
33. Wear well.
34. Fit well.
35. Stylish.
36. Pure silk.
37. Fast colors.
38. Fast colors guaranteed.
39. Double heel and toe.

40. Seamless.
41. More stitches per inch.
42. Closer *knit (or woven).*
43. Reinforced where the wear comes.
44. Best for 50 years.
45. Made in daylight plant.
46. Every pair will *fit and wear satisfactorily.*
47. Snug fit at the ankle.
48. The sheer beauty of ———.
49. *Wears* as well as it *looks.*
50. In many weights and shades.
51. Pure thread silk
52. The first socks in America to be knitted by machinery were made at ——— in 1822.
53. 97 years ago.
54. More *than 50,000,000* pairs of ——— *that gave satisfaction last* year.
55. Doing one thing well for almost a century.
56. Satisfying the needs of human feet.
57. Oldest and one of the largest hosiery mills in the United States.
58. Why have holes in your hosiery?
59. Reinforced hosiery for men, women, and children.
60. Makes a sensible gift for men or women.
61. It furnishes the kind of service that justifies the purchase.
62. Dependable wear and snug clean-cut appearance.
63. Hosiery satisfaction.
64. There's *real comfort for tired or tender feet in* ——— *fashioned* hose.
65. The method of knitting these stockings is different.
66. Patent machines that "knit in" the proper shape and fit, without seams.
67. No homely stitching up the back of the leg.
68. No seams to walk on.
69. *Just a soft smoothness that gives real comfort.*
70. The fit is snug and firm everywhere.
71. There's no room for wrinkles in ——— hose.
72. Extra elastic, narrow tip, prevents garter runs.
73. Style, quality and sound value.
74. Fascinating new designs in ——— silk hosiery for summer are certain to delight you.
75. Hosiery—each the best of its kind.
76. Home knit for our soldiers.
77. For those whose needs demand the essential combination of style, quality and sound value.

TABLE 1

A tabulation of the rankings of 77 hosiery appeals by 160 males and 75 females, listed according to the strength of the appeals as indicated by the results of the study

APPEAL KEY NUMBER	RATINGS				TOTAL SCORE*	AVERAGE	AVERAGE FINAL RANK		THE SALES APPEAL
	0	1	2	3			Males	Females	
5	1	6	55	98	410	2.56	1		Reinforced heels and toes
	0	4	25	46	189	2.51		1	
31	18	14	32	86	340	2.16	2		Guaranteed six months
	6	17	16	36	157	2.09		10	
21	12	26	47	65	335	2.08	3		Single sole with triple heel and toe
	3	13	26	33	164	2.19		6.5	
39	5	27	79	70	334	2.08	4		Double heel and toe
	5	2	39	28	164	2.19		6.5	
43	7	26	78	49	309	1.93	5		Reinforced where the wear comes
	3	6	27	39	177	2.36		4	
6	10	42	62	46	303	1.88	6		Specially constructed to guarantee long wear
	2	14	31	28	160	2.13		8	
17	14	40	64	42	294	1.83	7		Quality first
	6	14	25	30	154	2.05		12	
38	24	26	61	49	293	1.81	8		Fast colors guaranteed
	6	8	16	45	176	2.34		5	
36	21	42	60	37	273	1.71	9		Pure silk
	8	9	29	29	154	2.05		12	
32	27	41	57	35	260	1.62	10		Guaranteed to give satisfaction
	5	14	28	28	154	2.06		12	

* The total score, column 6, is figured as follows: For example, appeal no. 5 which ranked first by the males and females was rated 1 by 6 males 2 by 55; and 3 by 98; so that 1 × 6 = 6 + 2 × 55 = 110 + 3 × 98 = 294 = 6 + 110 + 294 = 410; etc. 410 ÷ 160 (the number of cases) = 2.56 (column 7), average score given to the appeal by males.

TABLE I—*Continued*

APPEAL KEY NUMBER	RATINGS 0	RATINGS 1	RATINGS 2	RATINGS 3	TOTAL SCORE*	AVERAGE	AVERAGE FINAL RANK Males	AVERAGE FINAL RANK Females	THE SALES APPEAL
40	25	40	67	28	258	1.61	11.5		Seamless
	37	19	12	7	64	0.85		67.5	
27	23	45	63	29	258	1.60	11.5		Fit like a glove
	6	21	31	17	134	1.78		20	
28	15	53	66	24	257	1.59	13		Tested for strength
	8	18	35	14	130	1.73		22.5	
1	35	36	51	38	252	1.58	14		The best of service
	5	22	26	22	140	1.86		19	
72	34	49	64	23	246	1.53	15		Extra elastic, narrow tip, prevents garter runs
	6	7	31	30	159	2.12		9	
30	12	24	54	70	242	1.51	16		Absolute fast colors guaranteed (new pair or your money back)
	3	7	16	48	183	2.44		2	
62	23	63	65	10	240	1.50	17		Dependable wear and snug clean-cut appearance
	12	14	31	17	127	1.69		25.5	
73	20	55	46	30	237	1.48	18		Style, quality and sound value
	8	11	22	33	146	1.95		16	
47	29	59	62	21	236	1.47	19		Snug fit at the ankle
	6	27	26	16	127	1.69		25.5	
20	19	71	50	21	234	1.46	20		Strong threads
	19	22	22	12	102	1.36		41	
14	29	56	49	26	232	1.45	21		Washing won't hurt them (don't get a cheap silk—it goes in the first wash)
	12	29	22	12	109	1.45		34	
51	25	48	68	29	230	1.45	22		*Pure thread silk*
	6	14	29	26	150	2.00		14.5	

TABLE 1—*Continued*

APPEAL KEY NUMBER	RATINGS				TOTAL SCORE*	AVERAGE	AVERAGE FINAL RANK		THE SALES APPEAL
	0	1	2	3			Males	Females	
37	28	50	68	14	228	1.42	25		Fast colors
	7	11	40	17	142	1.01		18	
50	21	64	61	14	228	1.42	25		Reinforced hosiery for men, women and children
	6	23	31	15	130	1.73		22.5	
68	20	58	49	24	228	1.42	25		No seams to walk on
	23	20	12	19	101	1.34		44	
69	28	42	61	16	228	1.42	25		Just a soft smoothness that gives real comfort
	12	20	38	5	111	1.48		33	
10	46	37	40	37	228	1.42	25		They're garter proof. "No run that starts above can pass the gold stripe"
	3	10	15	49	181	2.42		3	
35	21	65	44	26	226	1.41	28		Stylish
	22	18	18	10	102	1.36		41	
2	25	67	47	21	224	1.40	29.5		Made of tested combed yarns
	19	35	16	5	82	1.09		57	
54	30	46	64	20	224	1.40	29.5		More than 50,000,000 pairs of ——— that gave satisfaction last year
	21	23	21	10	95	1.27		49	
60	22	64	63	11	223	1.39	31		Makes a sensible gift for men and women
	10	23	31	11	118	1.57		30.5	
25	39	45	52	24	221	1.38	32		No seam to chafe or rub the skin
	27	19	13	16	93	1.24		51	
77	30	42	70	17	219	1.37	33		For those whose needs demand the essential combination of style, quality, and sound value
	7	10	29	28	150	2.00		14.5	
70	26	63	59	12	217	1.35	34		The fit is snug and firm everywhere
	9	26	27	12	116	1.54		32	

TABLE 1—*Continued*

APPEAL KEY NUMBER	RATINGS				TOTAL SCORE*	AVERAGE	AVERAGE FINAL RANK		THE SALES APPEAL
	0	1	2	3			Males	Females	
7	28	63	54	15	216	1.35	35		Maintain original high quality
	18	29	23	5	90	1.20		54	
23	30	60	58	12	215	1.34	36.5		Full fashion fits shape of the foot
	4	20	29	22	144	1.92		17	
24	52	44	51	23	215	1.34	36.5		Do not hang baggy
	27	16	25	7	100	1.33		46.5	
26	32	60	50	18	214	1.34	38.5		Snug fit prevents chafing the feet
	15	23	27	10	107	1.43		36	
33	32	55	60	14	214	1.34	38.5		Wear well
	9	24	24	18	126	1.68		27	
11	38	53	55	14	205	1.28	40 5		Silk stockings that wear
	6	28	20	12	120	1.60		29	
12	37	52	40	21	205	1 28	40.5		Good as they look
	12	32	21	10	104	1.38		38	
34	27	68	56	9	207	1.27	42		Fit well
	12	31	21	10	103	1.37		39	
4	29	67	53	11	202	1.27	43		Finished to retain the yarn in its greatest natural strength
	19	28	18	9	91	1.21		53	
19	37	58	52	13	201	1.25	44		Value for the price
	7	37	28	3	102	1.36		41	
18	31	65	57	7	200	1.25	45.5		Don't wear out quickly
	20	23	25	7	94	1.25		50	
71	37	40	51	13	200	1.25	45.5		There's no room for wrinkles in ——— hose
	10	15	27	12	105	1.39		37	

TABLE 1—*Continued*

APPEAL KEY NUMBER	RATINGS				TOTAL SCORE*	AVERAGE	AVERAGE FINAL RANK		THE SALES APPEAL
	0	1	2	3			Males	Females	
64	38 10	67 23	40 26	16 16	105 123	1.22 1.61	47	 28	There's real comfort for tired or tender feet in ——— fashioned hose
49	40 17	62 17	42 22	16 19	194 118	1.21 1.57	48	 30.5	*Wears* as well as it *looks*.
22	53 31	49 20	32 17	26 7	191 75	1.20 1.00	49	 60	Prolong the life by changing daily or oftener for summer. Change your socks and your shoes—it's a very restful thing to do
10	30 17	76 27	39 19	6 11	190 98	1.19 1.30	50	 48	All the qualifications of a guaranteed hose at half the price
42	48 30	49 23	53 18	10 4	188 71	1.17 0.05	51	 03	Closer knit (or woven)
20	39 43	67 23	40 8	13 1	187 42	1.17 0.56	52.5	 72	Long staple yarn
55	46 27	54 30	47 11	13 7	187 73	1.16 0.07	52.5	 61	Doing one thing well for almost a century
61	35 13	72 24	47 30	6 8	184 108	1.15 1.44	54	 35	It furnishes the kind of service and justifies the purchase
67	46 27	55 27	40 16	10 4	183 71	1.15 0.95	55	 63	Oldest and one of the largest hosiery mills in the United States
3	39 10	67 34	42 20	13 5	181 101	1.15 1.35	56	 44	Specially dyed
63	47 12	52 20	54 25	7 9	179 131	1.12 1.75	57	 21	Hosiery satisfaction

TABLE 1—*Continued*

APPEAL KEY NUMBER	RATINGS				TOTAL SCORE*	AVERAGE	AVERAGE FINAL RANK		THE SALES APPEAL
	0	1	2	3			Males	Females	
67	47	64	35	14	176	1.10	58		No homely stitching up the back of the leg
	30	18	22	5	65	0.87		66	
46	38	72	39	11	173	1.08	59		Every pair will fit and wear satisfactorily
	14	27	28	6	101	1.35		44	
74	45	66	41	8	172	1.08	00		Fascinating new designs in ——— silk hosiery for summer are certain to delight you
	12	12	33	17	129	1.72		24	
50	44	73	38	5	164	1.02	61.5		In many weights and shades
	22	17	25	11	100	1.33		46.5	
56	55	60	31	14	164	1.02	61.5		Satisfying the needs of human feet
	15	33	22	5	92	1.22		52	
58	55	50	32	13	163	1.01	63		Why have holes in your hosiery?
	28	19	21	7	82	1.09		58	
15	60	55	30	9	154	0.96	64		Be sure you get fresh stock when buying silk hose (new shipments just arrived in all desirable colors)
	17	29	24	4	89	1.19		55	
13	65	68	26	11	153	0.05	65		You get what you pay for
	23	27	16	9	86	1.15		56	
44	65	48	38	9	151	0.94	66		Best for 50 years
	35	20	16	4	64	0.85		67.5	
41	69	51	32	10	145	0.91	67.5		More stitches per inch
	53	12	7	3	35	0.47		74	
75	60	72	21	7	145	0.91	67.5		Hosiery—each the best of its kind
	21	32	19	2	76	1.01		59	

TABLE 1—*Concluded*

APPEAL KEY NUMBER	RATINGS				TOTAL SCORE*	AVERAGE	AVERAGE FINAL RANK		THE SALES APPEAL
	0	1	2	3			Males	Females	
66	75	61	30	4	133	0.83	69		Patent machines that "knit in" the proper shape and fit, without seams
	34	25	17	0	59	0.79		69	
48	74	52	27	7	127	0.79	70		The sheer beauty of ———
	33	24	10	8	68	0.00		65	
70	77	49	26	8	125	0.78	71		Home knit for our soldiers
	48	16	8	1	35	0.47		74	
8	78	57	18	7	114	0.71	72		Don't speculate with the money you invest in silk stockings
	40	27	5	3	46	0.91		71	
9	80	54	22	4	113	0.71	73		There is a certain satisfying value
	28	26	18	3	71	0.95		63	
52	91	34	28	37	111	0.60	74		The first stockings in America to be knitted by machinery were made at ——— in 1822
	52	14	6	3	35	0.47		74	
53	05	32	26	7	105	0.65	75		97 years ago
	57	8	4	5	31	0.41		77	
45	02	46	28	4	94	0.59	76		Made in daylight plant
	41	21	6	7	54	0.72		70	
65	78	67	15	1	93	0.58	77		The method of knitting these stockings is different
	48	21	2	3	34	0.45		76	

The results of this study are given in table 1. Column 1 of this table gives the key number of each sales appeal, indicating the position of its appearance on the original mimeographed sheet; columns 2, 3, 4, and 5 show the number of times each appeal was rated 0, 1, 2, and 3, for the males and females separately; column 6 gives the total score for each appeal; column

7 the arithmetic average; columns 8 and 9 the final rank for males and females; and column 10 the sales appeal. Thus the sales point, "Reinforced heels and toes," ranked first by both males and females; the sales appeal, "Guaranteed six months," ranked second by the males and tenth by the females; etc. The correlation between the final rank for the males and females $\left(\text{Spearman Footrule } r = 1 - \frac{6\Sigma d^2}{n\,(n^2-1)}\right)$ is + 0.81 and the correlation between two groups of 60 males is + 0.82; thus the results may be considered fairly reliable for the groups among which the study was conducted.

Since the results of this study are primarily given to illustrate the method as applied to advertising their practical value to the advertising copywriter may be questioned due to the inevitable factors that necessarily accompany the conditions under which the study was made. Chief among the objections are, that only the college-student consumer was studied; the difference between the artificial atmosphere under which the study was conducted and the conditions under which actual purchases are made; student reactions are not a perfect index of the general buyer's attitude; etc. Nevertheless, the following deductions that may be of some use to the practical man are pointed out.

The selling points vary widely in strength, the strongest appeal for males receiving an average score of 2.56, the weakest an average of 0.58; and for females the strongest average score is 2.51, the weakest 0.41. The appeals that show the greatest sex differences are numbers 40, 63, 74, and 10. These appeals, together with their final rank by each sex are listed as follows:

SALES APPEAL	THE APPEAL	RANK FOR MALES	RANK FOR FEMALES
40	Seamless	11.5	67.5
63	Hosiery satisfaction	57	21
74	Fascinating new designs in ——— silk hosiery for the summer are certain to delight you	60	24
10	They're garter-proof. "No run that starts above can pass the gold stripe"	25	3

Of the four appeals, nos. 63, 74, and 10, that are ranked much higher by the females than by the males, the first two are vague, while the third is primarily a feminine appeal, and although appeal no. 40, "Seamless," is also primarily a feminine appeal it is nevertheless not effective in influencing women to buy seamless hosiery. This statement is attested to by the fact that at least one manufacturer of seamless hosiery sews a thread up the back of his product to give them a seam-like appearance.

In an effort to see whether brevity played a noteworthy part in making an appeal strong or weak, the appeals were measured as to length. The average number of words in the ten strongest appeals for males is 4.0; for females 6.2; and the average number of words in the ten weakest appeals for males is 7.6; for females 6.5. Thus it may be noted that the strongest appeals on the average contain fewer words than the weaker ones; but while brevity may be a desirable factor in making appeals effective, it is not the most powerful factor in making for strength of an appeal; what really counts is the content of the appeal itself. A comparison of the content of the stronger appeals with the content of the weaker appeals reveals the fact that the main ideas embodied within the strongest appeals are durability, beauty, neatness, comfort; whereas there is no particular content in the weak appeals. They contain vague, irrelevant, non-personal statements which offer uncertain advantages to prospective customers.

As to the validity of the results of this study only the high degree of correlation between the groups tested is offered; and in answer to the question as to whether the "Method of Direct Impression" may be used to supplant or antedate the "Order of Merit Method" only subsequent studies, wherein the results obtained by the two methods may be compared, will tell. In one unpublished study, known to the writer, made by Prof. Albert T. Poffenberger of Columbia University, using seventy photographs, where the results of the two methods were compared the correlation was found to be almost perfect. Professor Poffenberger and the writer also have some additional statistical data, not yet worked up, which may throw some light on this question.

AN EXPERIMENTAL STUDY OF THE VOCATIONAL INTERESTS OF A LIBERAL ARTS COLLEGE GROUP[1]

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It is very apparent that the vocational guidance movement has outstripped adequate preparation for it. In many instances, regardless of where we see attempts at meeting the problem, we find great differences in the technique employed to discover vocational fitness. For the most part however, it is being done along subjective lines. The individual is given authoritative information which is not only a description of occupations, but also an account of what the worker in them has to do and know; in addition, to increase the thoroughness of guidance various other data are used such as, judgments as to the individual's fitness, academic marks (in a few cases, intelligence tests scores), achievement in extra-curricular activities, and other things of like character. Naturally, there are variations of this procedure, and a few exceptions. The most admirable exceptions are found in the attempts made by Professor Husband of Dartmouth, and Professor Thurstone of the Carnegie Institute of Technology, to raise vocational guidance to a scientific or objective plane.

The reason why there is so little scientific guidance is obvious —we need many more objective measures of vocational fitness; tests whose validity and reliability are sufficiently established for diagnosing and for predicting relative degrees of success in many occupations, and absolute success in one, if other things are equal. This naturally will entail concentrated effort for a number of years, not only in the actual making and standardization of tests, but in a very detailed analytical study of what actual vocational success depends upon. We can say in general, that occupational fitness depends primarily on bodily, intellectual, and temperamental traits. We have many valid and reliable measures of the first two, but traits of either, however accurately measured alone, are inadequate for giving a complete picture of an individual. We find very few measures of temperamental traits, so that to appraise the value of an individual without trustworthy measure of his reliability, his honesty, his courage or his self-dependence would be unpardonably stupid. Dr. Watson (1) says we need something even more than this, namely, that we need to keep for vocational guidance purposes, scientific records of individuals from the one hundred and fiftieth day of their lives on.

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[1] The writer wishes to extend appreciation to Drs. E. L. Thorndike, R. Pintner, and A. L. Rogers for timely suggestions in the construction of the tests.

> What objects they select day by day, what form their manipulation takes, and what early habits develop upon such primitive instinctive activity should be recorded day by day in black and white. There will be marked individual differences in the material selected, in the length of time any type of material will be utilized, and in the early habits which will arise . . . . but until we have followed up the future course of such . . . . we are in no position to make generalizations about the original tendencies which underlie the vocations.

Another possible determining factor which has been scarcely utilized for vocational guidance is the interests of individuals. Vocational guidance directors have sought to tap interests, to be sure, but few have determined accurately the degree to which any interest is possessed; they have not, to any degree of satisfaction, been able to tap accurately the interests of those who are not conscious, in the sense of full awareness, of a vocational interest. If we possessed full knowledge of the degree of existing interests we could then turn to a more intelligent study of the individual's abilities as related to his vocational interests. We have sufficient evidence to prove that if any individual pursues an activity in which he is wholeheartedly interested, he will put forth his greatest effort, which insures success within his limits. The evidence can be found in a review of a few scientific studies of interests (2). The most convincing among them is that of E. L. Thorndike (3). In his elaboration of the Bridge's (4) data he found the following:

> The order of a pupil's interests as he estimates them gives almost as good a prophecy of the order of his abilities as he estimates them. Neither gives a *very close* prophecy because the distinctions involved are so fine—and because the grade received in a single course is so afflicted with chance error. Widen the distinction (as by comparing mathematics, language, physical sciences, history, drawing and music) and reduce the chance error (as by taking the average in four or more courses in each) and the correlation between interest and ability will surely rise considerably above 0.70. On the whole Bridge's data seem to corroborate the doctrine of a very close relation between the order of an individual's interests and the order of his abilities.

These suggestions along with others influenced the writer to formulate a working idea to guide an objective study of vocational interests in Goucher College; the idea being, that if one made an information test based on interests, perhaps one would arrive at something more tangible by way of a guidance tool. The following sources served, for the most part, to furnish the vocabulary and test content: (*a*) information from books suggested by Frederick Allen (5), (*b*) information gathered by Elizabeth Kemper Adams (6) and (c) tabulated magazine and newspaper clippings read by Goucher students in incidental or casual reading for a period of three months. Several hundred tests of the recognition type, made up principally from these sources were criticized by judges who left 247 as being the most representative. On the cover page of the test appeared a suggested list of vocations for college women (6) with two directions to the student, (*a*) to underline five of her choices in order of preference, (*b*) to read the test directions and proceed when the signal was given. This test was given to 133 Goucher Juniors in January, 1922, and finished in fifty minutes by the quickest and in eighty minutes by the slowest. Samples of the test follow with directions.

Underline the word or words which will make the statement accurate.

Group I

The most widely used individual general intelligence test in the elementary schools is the

Pintner-Patterson Performance Tests Seguin Form Board Stanford Binet-Simon Army Alpha

The Education Bill would if passed

Abolish State's Rights Provide for government inspection of schools Allow for school standardization Establish a National Department of Education with a Secretary in the President's cabinet.

Group II

Root vegetables are best kept by

Cutting tops Removing dirt Keeping dirt and tops attached. Placing in water

The best depth of pan which will keep milk sweet longest is one which is

3 5 7 9 (inches)

Tripe is a

Fish Animal membrane Fowl Vegetable

In reading an electric meter the dial on the right in a complete revolution indicates in kilowatt hours

10 100 1,000 10,000

A butler or waitress should start to serve

Left of person at hostess's left Left of person at hostess's right Farthest person from the hostess Nearest person to the pantry

Group II

The "Findex System" is used in

Book-keeping Stenography Filing Typewriting

A comptometrist is secured to use principally a

Typewriter Dictating machine Telephone Computing machine

Group V

The "Hippocratic Oath" is taken by college graduates with an

M.D. Ph.D. A.B. Ll.B.

The capacity of an empty stomach is

0 1 2 3 (ounces)

Group VI

A codicil is

An attachment A bill A supplement to a will A wish

The greatest of our Chief Justices was

Wm. White Wm. Taft John Marshall James Kent

In January, 1924, a questionnaire was sent to each person and at the same time a "follow-up letter" to the employer. The results follow, but like so many other bits of psychological work they must be looked upon merely as a preliminary exposition of possibilities rather than as usable results.

RESULTS

I. *Choice, consistency and influence of parental occupation*

a. The suggested vocations for women college graduates are shown in table 1, along with the popularity of the first and second choices according to this group's selection. (The tests attempted to cover, in part at least, the same general vocational groups, with the exception of groups IV, VII, and VIII which were added by those who wished to vary from the suggested list.)

b. Only 0.4 per cent of the group seemed to be influenced in choice by their fathers' vocational pursuit, and according to the 1924 questionnaire only 0.15 per cent pursued the same. Only 0.3 per cent seemed to be influenced in making a second choice by their fathers' vocation, and only 0.08 per cent pursued the same. If we consider this result then, one might be able to say that the father's vocational pursuit has little, if any, influence in determining a *woman's* vocational choice. If we consider the influence of the mother's vocational pursuit as related to choice we find Homemaking to be the second largest group represented and, in a sense, quite closely related to the first choice group, that is, Educational and Social Service. One might then state that the native tendency in the case of women is a most potent determiner of vocational choice, disregarding, of course, other possible factors such as, the reluctance to accept directly the pursuit of a career with money earning responsibilities, desire for a certain amount of leisure or independence, etc.

c. The degree of stability or change of choice was revealed in the 1924 questionnaire when 24.8 per cent changed their first choice and 40.6 per cent changed their second choice. This perhaps reveals some truth in the traditional saying, "It is a

TABLE 1

SUGGESTED LIST OF VOCATIONS	FIRST CHOICE IN TOTAL PER CENT	SECOND CHOICE IN TOTAL PER CENT
*Group I (Educational and Social Service)**	41.3	00.0
1. Community Service		
2. Library and Museum Work		
3. Boy's and Girl's Work		
4. Vocational Guidance		
5. Educational Research		
6. Teaching		
7. Rural Work		
8. Protective Work		
9. Child Welfare		
10. Family Case Work		
11. Recreation		
12. Dramatics		
13. Interpreting and Translating		
14. Physical Education and Hygiene Teaching		
*Group II (Homemaking, etc.)**	27.0	15.0
1. Homemaking (Home Economics, Household Arts, etc.)		
2. Dietetics and Food		
3. Interior Decorating		
4. Institutional Management		
5. Costume Design		
*Group III (Business)**	17.2	12.0
1. Civic and Government Service		
2. Personnel Management		
3. Professional Secretarial Work		
4. General Secretarial Work		
5. Salesmanship		
6. Advertising and Publicity		
7. Banking		
8. Publishing		
9. Business		
Group IV†	0.00	5.26
1. Journalism		
2. Short Story Writing		

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* The names in parenthesis designate the general fields covered in those groups.

† Not included in the test.

TABLE 1—*Continued*

SUGGESTED LIST OF VOCATIONS	FIRST CHOICE IN TOTAL PER CENT	SECOND CHOICE IN TOTAL PER CENT
*Group V (Science, etc.)**	5.26	5.26
1. Medical Social Work		
2. Medicine		
3. Biological Work		
4. Technology		
5. Chemistry		
6. Bacteriology		
*Group VI (Law)**	0.75	0.75
1. Law		
Group VII†	0.75	0.75
1. Art		
2. Architecture		
Group VIII†	0.75	0.75
1. Music		

woman's privilege to change her mind." In addition, one fourth would change their academic major if they had the opportunity. The willingness to change the academic major is more explainable, but both seem to emphasize the unreliability of choice in either case and the need for more accurate vocational and educational guidance in the selection of a vocation and of an academic major.

II. Correlations

a. The relationships between choice and the Vocational Test scores for all students are shown in table 2.

These correlations are all "low" (7); further if the test has any validity, they seem to verify the results obtained above in relation to change of choice, namely, the undesirability of using choice as the reliable index of interest in guidance. In other words, only 24 per cent followed their first choice, 27.8 per cent their second, and 20.3 per cent are pursuing vocations in other fields not mentioned in their choices. It is also very probable that of all these numbers there are some who are still unsettled as to permanent selection.

b. The relationship between Intelligence (scores determined by the Thorndike Intelligence Examination for High School Seniors) and scores obtained in this vocational test for three groups of students follows (table 3).

The correlations between the Vocational Test scores and the Intelligence Test scores for all students seem to be "low," showing no relationship. The vocational test was intended to test the ability to recognize information based on interests. The person therefore who has a deep interest in Law, for instance, as a probable vocation, need not necessarily be of superior intelligence. One deduction then is that for specific guidance we cannot rely upon Intelligence Tests for an unselected group.

TABLE 2

TEST NAMES	CORRELATION BETWEEN CHOICE AND VOCATIONAL TEST
Group I (Educational and Social Service)..........	0.21
Group II (Homemaking)............................	−0.02
Group III (Business)................................	0.17
Group V (Science)...................................	0.05
Group VI (Law)......................................	0.33

TABLE 3

NAME OF VOCATIONAL TEST	CORRELATION COEFFICIENT—INTELLIGENCE SCORES AND VOCATIONAL TEST SCORES		
	All students	Phi Beta Kappas	Journalism choices
Group I (Educational and Social Service)................	−0.08	0.38	−0.28
Group II (Homemaking, etc.).......	0.19	−0.04	0.15
Group III (Business)................	0.30	0.41	0.67
Group V (Science)..................	0.10	0.12	0.94
Group VI (Law)......................	0.28	0.23	0.79

The correlation of the same test scores for selected groups show a few interesting correlations. The Phi Beta Kappa group show "marked" (7) correlation in tests for Group I (*Educational and Social Service*) and *Group III* (*Business*). The group selecting Journalism as a vocational choice shows one "high" (7) correlation in the test for Group III (Business) and two "very high" (7) ones in Groups V (Science) and VI (law). There seems, then, to be some relationship between Intelligence Test scores and these Vocational Test scores in special groups. In addition, there were 57 per cent of those selecting Journalism as first choice who were above the median in all of these tests, while 42.8 per cent were above the median in all but one test; this might indicate that those selecting Journalism possess versatile interests.

c. The only correlations which show any significant degree of relationship follow (table 4).

TABLE 4

NAME OF TEST	CORRELATION BETWEEN VOCATIONAL TEST AND SUCCESS ESTIMATED ON A SCALE OF FIVE	
Group I (Educational and Social Service)	0.71	±0.05
Group II (Homemaking)		
Group III (Business)	0.81	±0.09
Group V (Science)	0.67	±0.07
Group VI (Law)		

One might state then, that since three of these coefficients of correlation supplemented by their probable errors (i.e., a correlation should be four times its probable error) are reliable and "high" (and one "very high") that the vocational test is capable of predicting fairly accurately (within these limits) degrees of success. The number of cases included represents 63 per cent of the original group, as 37 per cent are not pursuing paid vocations. There is no correlation for Homemaking as we did not take the estimates of success made by husbands seriously, first, because they, no doubt, would have been prejudiced by new factors, and second, because they probably would not have analyzed homemaking into its recognized components. No one is pursuing Law (the only other test for which we have no correlation), in fact or in study, and no one is pursuing Art, Architecture or Music, mentioned by a few as their desired choices.

If degrees of interests are indicative of success it would seem that this test has some degree of validity which is a little more objective than (*a*) choices as the individual selects and holds to them, and (*b*) general intelligence tests as used for specific vocational guidance. If then, this kind of a test were enlarged to include all vocations and its validity as well as reliability proven within the desired limits, one could then use it as a substitute for many things used in present guidance. Present vocational guidance is "in the condition in which students of temperature were before the discovery of the thermometer, or any other scale for measuring temperature." For the most part vocational guidance directors up to the present time have been interested in organization and have about completed that phase of it, at least in theory if not in fact. The next logical step is to find some objective procedure that will suit the time at present available for guidance, the present vocational guidance staff, and the great numbers demanding guidance. This challenge is becoming most imperative.

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NOTES AND NEWS

SPECIAL CLASSES FOR FEEBLE MINDED AND SUB-NORMAL CHILDREN

Enrollment in schools and classes for feeble minded and sub-normal children in this country shows an extraordinary increase in the past twenty-two years, according to a report made public today by the Department of the Interior through the Bureau of Education. This increase does not show that a greater percentage of children are becoming mentally defective from year to year, but it indicates a growing interest on the part of cities, States, and private organizations in making provisions for this unfortunate class.

In 1900 the 29 schools reported had 10,217 inmates. Although city schools were not reported separately, it appears that there were then very few city classes for defectives. In 1918, 206 schools reported 55,084 pupils The 214 schools in 1922 reported a total of 63,399 pupils. The enrollment has increased 15 per cent during four years. This is more than twice as much as the increase in enrollment in public elementary and secondary schools during the same time.

Three types of school for the mentally defective are shown in the report, viz., State institutions, private institutions, and city day schools. About one-half of the total number, or 133, are classes in city day schools, 51 are State institutions, and 30 are private institutions.

The principal increase in number of pupils has been in city day schools, which enrolled 18,133 in 1918 and 23,253 in 1922, an increase of 5149. The increase in the city schools shows a tendency on the part of local authorities to take care of local situations, in this way to do a great service to the child in keeping him with his parents, and at the same time to relieve the regular school teachers of a responsibility which should not be expected of them.

Total receipts of State institutions reporting for the year 1921–1922 amounted to $14,911,234. The expenditures for buildings and lasting improvements, teachers' salaries, books, etc., and current expenses, were $13,315,370. The total receipts of private institutions for the same period were $727,143, and the expenditures were $710,263. State institutions reported property with a total value of $45,821,771. The value of property of private institutions amounted to $1,460,862.

A bulletin containing a detailed statement on these subjects has been issued by the Commissioner of Education of the Interior Department.

THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The British Association for the Advancement of Science, while resembling the American Association for the Advancement of Science, nevertheless differs from it in certain particulars.

"The objects of the British Association are: To give a stronger impulse and a more systematic direction to scientific enquiry; to promote the intercourse of those who cultivate science in different parts of the British Empire with one another and with foreign Philosophers, to obtain more general attention for the objects of science and the removal of any disadvantages of a public kind which impede its progress."

The Association, which was founded in 1831, meets annually for one week or longer at important centres, other than London, in England, and it occasionally meets in other parts of the British Empire.

The Association has met in Canada on three previous occasions, viz., in 1884, 1807 and 1909. Other overseas meetings have been held once each in South Africa 1905 and Australia 1914.

The average attendance at annual meetings of the Association for the eighty-three years previous to 1920 was 2330. The Toronto meeting affords an exceptional opportunity for intercourse between British, Canadian, American and European workers in Science.

A preliminary programme will be forwarded on application to the Local Secretary, British Association, Physics Building, University, Toronto, and those who intend to be present at the meeting are particularly requested to apply for this as soon as possible.

No technical qualification is required on the part of an applicant for admission as a member of the Association nor is there any limitation in respect of nationality.

The form of membership of most interest to Americans and Canadians, who are very cordially invited to join for 1924, is that of annual member.

Payment of $7.50 made before or at the meeting entitles the annual member to attend the meeting and to receive the report. Payment of $5.00 entitles the member to attend the annual meeting and the membership ticket admits the holder to any of the sectional meetings and to the various popular lectures, receptions, local excursions, etc., which are features of the meeting.

Membership tickets for the meeting may be obtained from the local Hon. Treasurer, British Association, Room 50, Physics Building, University, Toronto; cheques should be made payable to the British Association for the Advancement of Science.

Arrangements are being made with the Railway Companies for reduced rates on the return fares of those who hold membership cards.

Hotel accommodation should be reserved in advance of the date of the meeting.

Scientific meetings

The Inaugural General Meeting will be held on Wednesday, August 6, when Major-General Sir David Bruce, K.C.B., F.R.S., will assume the Presidency of the Association in succession to Professor Sir Ernest Rutherford, F.R.S., and will deliver the Presidential Address.

The Association is organised in thirteen sections, those of chief interest to readers of this journal being: Economic Science and Statistics, Sir William Ashley; Anthropology, Dr. F. C. S. Shrubsall; Physiology, Dr. H. H. Dale, C.B.E., F.R.S.; Psychology, Prof. W. McDougall, F.R.S.; Educational Science, Principal Ernest Barker.

Addresses will be delivered by the Sectional Presidents of the respective sections and papers will be read on and after Thursday, August 7, until the conclusion of the meeting.

Joint meetings of various sections will be held also at which the following are among the subjects to be discussed: Sections B and I, Vitamines and the relation of light to their action; Sections I and J, Physiological and psychological factors of muscular efficiency in industry; Sections J and L, Tests for scholarship and promotion; Sections H and J, Racial mental differences.

During the week of the meetings a number of popular lectures will be delivered by prominent visitors. Among the titles which have been announced are: "Human Heredity and National (or racial) Outlook," by Professor W. McDougall, M.B., F R.S.; "Seeing is Believing," by Professor E. P. Cathcart, M.D., F.R.S.; "Voice Production" by Sir Richard Paget; "The Importance of the Infinitely Small in Nutrition," by Professor J. C. Drummond D. Sc.

A lecture to the Workers Educational Association will be delivered by Professor R. H. Tawney of Oxford University.

The subject of the Presidential Address by Sir David Bruce will be "Advances made in our knowledge of disease (with special reference to methods developed during the war)."

Additional information will be gladly supplied by the Local Secretary, British Association, Room 50, Physics Building, University, Toronto, Canada.

Summary of Programme of Section L—Education May 8, 1924

The President's address will be delivered by Ernest Barker M.A., D.Litt., LL.D., Principal of King's College, London, well known for his writings on political history and thought, who will speak on the subject "The Nature and Conditions of Academic Freedom in Universities."

The programme in brief is:

General. "Teaching of the History and Geography of the British Empire," by Professor Wrong, Toronto.

"Modern Tendencies in Geography Teaching," by E. Young F.R.G.S., Secy. Middlesex Education Committee.

"Interchange of Teachers between Different Branches of Education," by Prof. P. T. Nunn, Principal London Training College.

"Modern Developments in Method and Scope of Adult Education," by Dr. Heath.

"Modern Developments in Science Teaching," by Mr. C. N. Stewart.

"The Place of Classics in a Secondary School Education," by Mr. Legge.

"The Canadian University," by Sir Robert Falconer.

"An Educational Experiment in Rural Saskatchewan," by Prof. G. M. Weir, University of British Columbia.

"The Adolescent Education Act in Ontario," by Major J. P. Cowles.

"Selection of Pupils for Auxiliary Classes," by Dr. S. B. Sinclair.

"Educational Administration in Canada," by Rev. Canon Cody (late Minister of Education for Ontario).

"The Psychologist and the Education Committee," by Dr. Cyril Burt, London County Council Education Department.

"The new Curriculum for French Secondary Schools," by Mr. A. H. Hope.

Joint Sectional Sessions. With Psychology Section.

"The Use of Partial Coefficients of Correlation in Educational Research," by Messrs. Sandiford, Brennand and Holmes, Toronto.

"Tests for Scholarship and Promotion," by Dr. Cyril Burt.

"The Training of Pupils Intended for an Overseas Life."

Popular Lectures.

"Sense of Humour in Children," by Dr. Charles Kimmins M.A., Chief Inspector of the Education Department, London County Council.

"Voice Production," by Sir Richard Paget.

BUREAU OF EDUCATIONAL AND VOCATIONAL GUIDANCE

The University of North Carolina has established, under the direction of the Department of Psychology, a bureau for the investigation of methods for promoting the educational adjustments of its students, and for psychological guidance in the choice of vocations and in adaptation to the various phases of student life. The major problems which are to be undertaken by this bureau are the assembling of a complete bibliography upon various phases of vocational and personnel work, the collecting and administering of available tests for the measurement of mental and vocational aptitudes, the administration of tests of intelligence and other traits to freshmen, and the working out of an administrative technique whereby the results of such tests may be made effective in the organization of college work, the development through research of a suitable group scale for the measurement of fundamental personality traits, the promotion of mental hygiene among students by general methods and more particularly by the individual treatment of students whose work is handicapped by emotional conflicts and other nervous conditions. The work at North Carolina is still in its infancy, but it is hoped that progress will be made toward supplying at this university a need which is now realized by many educational institutions. The purpose of this notice is to enlist the advice and coöperation of similar personnel organizations throughout the country. Address: The Bureau of Personnel Research, Department of Psychology, University of North Carolina, Chapel Hill, N. C.

BOOK REVIEWS

A. J. Snow. *Problems in Psychology.* Henry Holt and Company, New York, 1923.

In this small volume the author has collected approximately one thousand problems related to the major aspects of psychology. The author states that no attempt has been made to select the problems with the thought of developing a single psychological point of view. On the contrary care has been taken to direct the student's attention to different points of view. The problems are grouped into seventeen sections. The first sixteen of these bear chapter headings usually found in modern books on psychology. The last chapter containing two hundred and ten questions relates to the different fields of psychology, including animal, social, and general psychology.

Good problems are always valuable in teaching any subject but are not always ready when the occasion demands. This collection of problems will tend to supply this deficiency and materially aid in making the teaching of psychology more concrete. In doing this, it will serve a definite pedagogical purpose. The *Problems in Psychology* will be found to be a valuable supplement to the text-book and references in any course in psychology.

William Sims Allen, Ph.D. *A Study in Latin Prognosis.* Teachers College, Columbia University, Contributions to Education, No. 135. New York City, 1923.

The author of this monograph attempts to show to what extent success in Latin can be predicted by the use of certain standardized tests. As a basis for his conclusions the author studied the success in Latin of three hundred and sixty-four boys electing this subject in the Boys' High School, Brooklyn. They were divided into eleven classes taught by four teachers. The class grouping was based on the results of the Otis Group Intelligence Scale given in June before entering High School in September.

For the purpose of selecting a test or a group of tests that would have prognosis value, twenty some different tests were given at the opening of school in September. The list of tests follows (page 3):

1. Briggs Analogies Test Alpha
2. Briggs Analogies Test Beta
3. Thorndike-McCall Reading Scale Form 3

4. Thorndike-McCall Reading Scale Form 4
5. Kelley-Trabue Completion Test Alpha
6. Kelley-Trabue Completion Test Beta
7. Thorndike Test of Word Knowledge Form A
8. Thorndike Test of Word Knowledge Form B
9. Thorndike Non-Language Test Forms IA, IL, IIB
10. Terman Group Test of Mental Ability Form A
11. Terman Group Test of Mental Ability Form B
12. Rogers Test of Mathematical Ability
13. Free Association Test
14. Wylie Opposites Test A
15. Wylie Opposites Test B
16. Wylie Opposites Test C
17. Wylie Opposites Test D
18. Wylie Opposites Test f
19. Wylie Opposites Test l
20. Wylie Opposites Test r
21. Wylie Opposites Test t

It will be seen that the author in selecting the prognosis tests made extensive use of those that measure language ability in its various phases.

At the close of the first semester eleven pairs of Latin tests were given. Professor Briggs in devising these Latin tests sought to isolate and measure the different phases of Latin taught during the first semester. The list of these tests follows (page 7):

1. Syllabification Tests Alpha and Beta
2 Gender Tests Alpha and Beta
3. Nouns Alpha and Beta
4. Pronouns Alpha and Beta
5. Conjugation Alpha and Beta
6. Vocabulary Alpha and Beta
7. Derivation Alpha and Beta
8. Construction Alpha and Beta
9. Pronunciation Alpha and Beta
10. Translation: English to Latin Alpha and Beta
11. Translation: Latin to English Alpha and Beta

The results of these tests were tabulated and given the usual statistical treatment and yield three prognosis tests with high reliability and fair predictive power.

The first prognosis test is composed of Briggs Analogies Alpha, Thorndike Test of Word Knowledge A, and Rogers Interpolation 2. The test requires thirty-five minutes to administer and yields results with a reliability of 0.880 and gives a prediction of 0.559.

The second test is composed of Briggs Analogies Beta, Thorndike Test of Word Knowledge B, and Rogers Interpolation I. This test also requires thirty-five minutes to administer and yields results with a reliability of 0.880 and gives a prediction of 0.578.

The third test consists of prognosis tests 1 and 2, and requires seventy minutes to administer with a reliability of 0.936 and gives a prediction of 0.588.

The results also indicate that the same groups of tests predict English and Mathematics success almost as well as they predict Latin success. It should be noted that the author does not recommend the exclusive use of these tests in admitting and excluding pupils. In the case of Latin other means should be used, including various school records, teachers' marks, teachers' estimates, and personal conferences.

Such studies as this one are valuable not only for specific facts pointed out but as a method of approach to one of our perplexing problems.

PERCIVAL MALLON SYMONDS, PH.D. *Special Disability in Algebra.* Teachers College, Columbia University, Contributions to Education, No. 132. New York City, 1923.

In this study Professor Symonds has given his attention to a special disability—disability in Algebra. The monograph is divided into nine chapters. He has also appended a selected bibliography of fifty-eight titles. The scope of the study can best be presented by a statement of the subject of the several chapters.

Chapter I presents the problem of special disability and suggests methods of study. In Chapter II there is a discussion of individual differences in Algebra as indicated by the results obtained from the use of tests by Hotz and Rogers.

Chapter III describes the results of a careful study of twenty-two pupils selected because of their special disability in Algebra.

In Chapter IV we find descriptions of the peculiar mathematical disabilities of several of the cases selected for study in Chapter III.

In Chapter V and VI methods for correcting coefficients of correlations for attenuation and selection are developed.

Chapter VII makes corrections of coefficients of correlation reported by different investigators. The methods used in making these corrections are those outlined in Chapters V and VI.

In Chapter VIII we find the author's attempt to interpret the corrected correlations of Chapter VII as an agency in determining the amount and frequency of special disability in Algebra.

In the last Chapter the practical conclusions for school purposes are summarized.

Certain facts brought out by the study are of interest to students of applied psychology.

1. It seems clear that the last three months of school-year in algebra is only a fraction as profitable for the modal pupil as the first three months. The student has ceased to learn or he is learning something that can not be measured in the ordinary manner

2. There is a genuine increase in variability of distribution toward the close of the year. This perhaps indicates that some pupils continue to learn even at the end of the year, while others stopped learning before reaching the end of the year.

3. The study of the twenty-two cases of special mathematical disability warrants the conclusion that "Those who have special disability in mathematics are not deficient in working with the other materials with which intelligence deals." Even disability in Algebra does not signify disability in geometry. There is evidence to indicate that special disability in mathematics is due to material or content and not form (page 27).

After correcting coefficients of correlation between Algebra and other studies the author reports the following summary:

Algebra correlates with geometry, English and intelligence.

	UNSELECTED POPULATION	HIGH SCHOOL FRESHMAN
Geometry	0.82	0.73
English	0.76	0.63
Intelligence	0.80	0.70

On the subject of the *frequency* and *amount* of *special disability* the author concludes that "high intelligence means good ability in Algebra and low intelligence means poor ability in Algebra." "Of the twenty-two brightest pupils out of the hundred seventeen will be above the average in Algebra, and of the twenty-two stupidest pupils seventeen will be below the average in Algebra."

The author does not undertake to say who should study Algebra. The answer to the question must in the main depend on other than psychological considerations. Psychology has made its chief contribution when it predicts algebraic ability. This, the author believes, can be done by the use of intelligence tests since there appears to be a high correlation between success in Algebra and intelligence. An understanding of special disability in Algebra will aid in considering courses of study, text-books, class assignments, and class periods.

While the study has limitations, on the whole it is a valuable contribution to education and should stimulate similar studies in other subjects.

FRANK N. FREEMAN AND MARY L. DOUGHERTY. *How to Teach Handwriting.* Houghton Mifflin Company, Riverside Press, Cambridge, Mass., 1923.

In *How to Teach Handwriting* the authors have made an excellent and timely contribution to our pedagogical literature. Too long have we waited for such a treatment of this subject. In this volume we have a teacher's manual of handwriting that is scientific as well as practical. The authors have been guided in the preparation of the *Manual* by the well established principles of handwriting resulting from the careful experimental studies of Professor Freeman. The results of his investigations have been fully described in his monograph entitled *The Handwriting Movement.*

As the title indicates it is a volume that will serve the needs of the *class-room teacher as well as the supervisor of writing.* The first thirty-four pages give a brief summary of the most important principles fundamental in learning to write. The major portion of the book gives details for conducting lessons in the subject.. Much attention has been given to the selecting and arranging the exercises. As a result of this we have the course in writing for the first six grades outlined in detail. Definite goals for each stage of the six-year course have been determined, thus making it possible for the instruction in handwriting to go forward in a consistent and pedagogical manner.

The authors have in this *Manual* attempted to dispel two illusions that have had more or less influence on the teaching of handwriting. In the first place they have attempted to make it clear to those interested that satisfactory writing can not as a rule be left to chance and to incidental teaching of the subject. In the second place they have shown that the teaching of handwriting is not surrounded with mystery and difficulties which can be mastered only by a few especially endowed. In their treatment of the subject they point out that here we have a subject the learning of which follows certain fundamental principles that may be applied by the class-room teacher. This *Manual* will do much to clarify the writing situation in our schools, and to place the teaching of this fundamental tool of learning on a sane and scientific basis.

WILLIS L. GARD,
Ohio University.

J. E. W. WALLIN. *The Diagnostic Findings from Seven Years of Examining in the Same School Clinic* Miami University.

This is a summary of the diagnostic findings of seven years' work in the St. Louis Psycho-Educational Clinic. Dr. Wallin says that no similar summary of diagnostic findings from a similar clinic for an equal period of time has ever been published before. In this study

Dr. Wallin finds a lower percent of feebleminded in the elementary schools of the St. Louis Public Schools than is believed by other workers in the field of clinical psychology. However, Dr. Wallin does not define what he means by the term "Feebleminded." He possibly is not including the higher types of mentally deficient people. Dr. Wallin states that the lower classes are not included in his percent. He stresses that every large school system must have, in addition to the special schools for feebleminded, a much larger number of ungraded classes for children who, while not feebleminded, are so backward either in intellectual or pedagogical status as to require individual instruction or a differentiated course of study. He says that as a result of this study that the number of pupils assigned to special classes should vary from 1 to 5 per cent of the elementary school population.

Considerable discussion and data are given on different types of mentally deficients such as the mongolians, cretins, epileptics, hydrocephalics, amaurotics, psychopaths, speech defectives, neurotics and delinquent children. He found nine times as many speech defectives among the special class children as he found in the total population of elementary pupils. This seems to show us that speech defect is a mental condition. Dr. Wallin says, in speaking of psychopathic children, that their conduct had changed from one of disorder to order after being placed in special classes.

The data contained in this pamphlet and the descriptions given are of highest value to educators interested in carrying out a complete school system.

LA VINIA WARNER,
Ohio University.

WALTER DILL SCOTT AND ROBERT C. CLOTHIER. *Personnel Management, Principles, Practises and Point of View.* A. W. Shaw Co., 1923. Pp. xxii, 643.

The new "science in management" has now provided a manual of procedures and practises and a systematic point of view on the subject of individual human adjustments in industry. The volume crystalizes, in its application to industry, the experience of the Committee on Personnel in the Army and the work of the Scott Company in coöperating with more than forty industrial and business concerns. The scientific background of President Scott, his contact with the personnel research bureaus at the Carnegie Institute of Technology and with the direction of classification of men in the army, Mr. Clothier's practical experience as employment manager of the Curtis Publishing Company and the accomplishments of the groups of men working with them have been ably organized into a systematic and consistent whole. Applied psychology is now able to stop and look about to see the personnel movement in perspective, to ask what may have been neglected and what should be the next step.

The central idea from this stereoscopic view formulated by Scott and Clothier is the scientific study of the man-in-his-work for the purpose of both increasing the efficiency of production and the happiness of the worker through better adjustment of industry to individual differences. As the authors say, it is no longer the square peg in the round hole for both the man and the job are regarded as modifiable, changing, developing. The worker is not a machine, still less a commodity, but a human organism which is to be adapted to variable work opportunities.

This splendid contribution of a systematic viewpoint should lead no reader to classify the book as theoretical. Nine-tenths of the content is taken up with descriptions of specific instruments for facilitating human adjustments and careful directions as to how the methods are to be introduced and coördinated. The descriptions of the methods are accompanied by examples of their use in practise. The officers of any concern as well as those professionally interested in personnel work can thus obtain a comprehensive idea of the functions of a personnel department and detailed information of methods for the personal adjustment of a *worker-in-his-work*. The authors have chosen to describe one selected complete series of methods as worked out by their group of consultants, rather than to set forth the variety of forms of each method. *The result is a thorough occupational description of the work of a personnel department as they see it.* Approved practises are set forth for reaching the source of labor supply, occupational descriptions, application blanks, testing qualification cards, rating scales, promotional charts, training, personnel control charts, the introduction of the worker to his work, supervision and follow-up, incentives, procedure in making adjustments, and the use of personnel instruments in control of salary and of labor turn-over. Four appendices show the development of the graphic rating scale, of a plan for apprentice training, a summary of the literature on labor turnover and samples of reports after personnel surveys. The bibliographies throughout are excellent.

The Personnel Department is "principally a staff department," acting as "a connecting link between the officers who determine the personnel policies of an organization and the departmental executives whose duty it is to execute those policies." The description of staff and line functions is manifestly influenced by the organization of personnel work in the army. In the form of the instruments also, it is clear that the experience with the army has been highly valued. The methods, however, have been adapted to industrial conditions and have been tried out to show their usefulness. Even a concern with the most democratic organization of its employees instead of the common army type of responsibility, will need these personnel instruments for making individual adjustments. The authors are confident that their "science in management" is widely different from "scientific management" as operated in the average plant. Their view stresses the fairer distribution of happiness among the workers as well as greater efficiency. They point out that labor has supported the work of the Personnel Research Federation and is not opposed to that scientific study of human relations which has sufficient regard for justice to the workers.

By leaving the determination of labor policies to company officers outside the personnel department, and by omitting all discussion of shop councils, labor organizations, collective bargaining, etc., it is clear that the authors have taken a distinctive point of view towards the functions of personnel administration. It might be characterized as an endeavor to stick to the strictly psychological problem of adjusting individuals and their work. It may even be the hope of the authors that this plan offers the best solution of the clash between organized groups of employers and employees. At any rate it is a distinctly different conception of personnel management from that commonly found in books on personnel administration. The problems of group psychology are obviously omitted. The authors wisely do not attempt to cover all questions connected with the human factor in industry. The book contrasts also with the contents and viewpoint of such a book as Myer's Mind and Work which set the background for English movement to establish an independent institute of psychology and physiology to scientifically investigate the human problems of unrest in industry. The usefulness of psychology to industry is clearly not limited to problems of individual adjustment, although here Scott and Clothier have demonstrated that it has quickly advanced far in technique and assurance of success.

The final chapter on Research is almost a classic in its brief and vigorous statement of prevalent attitudes of industrial and business executives which make it difficult for them to acquire a scientific attitude toward their personnel problems. To the alert and far-seeing executive, scientific personnel study affords not only a promise of high reward to his concern but also the means for it to attack the "diseased" industrialism of which Carleton Parker warned, and to meet its obligation to work toward greater social justice as well as against economic waste. Such industrial leaders should be inspired by this spot-light which shows clearly one road up which to advance.

In this early stage of the science of personnel, applied psychologists can hardly be blamed if they treat this highly authoritative book almost as if it were written on tablets of stone.

J. B. MINER,
University of Kentucky.

DANIEL ALFRED PRESCOTT, Ed.D. Psycho-Educational Clinic, Harvard University. *The Determination of Anatomical Age in School Children and Its Relation to Mental Development.* Harvard Monographs in Education. Whole No. 5, Series I, No. 5. Cambridge, Mass. The Graduate School of Education, Harvard University. July, 1923.

This interesting study is based on the measurements of radiographs of three thousand children. Its purpose is to establish norms of anatomical development and to measure the deviations of certain individuals from these norms and from the norms for mental development, with a view of finding out something of the relationship between physical growth and mental development. This should be of interest to educators, to those interested in athletics and also to students of child study. The anatomy of the wrist was taken as the index for this study and X-ray pictures were taken of the wrists of both boys and girls.

Extended references were made to Mr. Rotch, also Mr. Smith of the United States Naval Academy, and Mr. Woodrow and Lowell and others. Children from six years on up into adolescence and some adults were included in the study. Both normal and feebleminded individuals are included. A chapter is given to the description of the apparatus and the method used in finding these measurements.

It was found through this study that the mentally deficient are also retarded anatomically, that is, the mental deficients were discovered to be lacking in a well rounded, complete development. It was discovered that girls are about eighteen months ahead of boys throughout the whole period of growth, from six to maturity.

A chapter is given to case study which is very interesting to the student of mental, physical and anatomical growth of children.

M. LA VINIA WARNER,
Ohio University.

LILLIEN J. MARTIN. *Mental Training for the Pre-School Age Child.* Harr Wagner Publishing Co., San Francisco, 1923. 100 pp.

Following a brief foreword this little book consists of I, a Mental Hygiene Questionnaire; II, discussion of a child's training from the standpoint of heredity, physical and psychological examination, interaction of the mental and physical, imitation, habit making and breaking, emotional development and control, incentives to action, dependence versus independence, responsive versus resistent attitude, environment, storing the subconscious, play, delinquent tendencies, punishment and sympathy; and III, the Education of the Parents.

Part I gives a list of seventeen questions to which answers are secured from mothers whose children Dr. Martin examines. This is a valuable list of questions not only for all parents but for all teachers responsible for the training and educating of growing children. While not an exhaustive list of all questions which might be asked, it is very complete because directed at the vital sources of life's fundamental driving and directing forces. In Part II the content of each of these questions is transformed into a positive constructive statement called a rule. After a brief, well chosen discussion and explanation of each of these 17 rules, the histories of several children are given in sufficient detail, but not tedious, to show specifically how the rule applies in solving problems of individual children. This gives value and vividness to the theory brought out in the discussion and makes the entire book very readable and practical.

Part III is very brief. In it the responsibilities of parenthood are emphasized.

This book gives simple directions for the training of young children upon a scientific basis. Such training when intelligently given is humane beyond comparison with any other method. It is so simple and practical that no parent or teacher can help but learn much from studying it.

HERMAN H. YOUNG,
Indiana University.

EDGAR DUNNINGTON RANDOLPH. *The Professional Treatment of Subject-Matter.* Baltimore, Warwick and York, 1924. Pp. 202. $2.20.

The author brings to this study a rich background of experience in the public schools, in normal schools, in a liberal-arts college, in a teachers college, and more recently in a department of education in a great western university. The interest centers in the problem: Should instruction in subject-matter in a teachers college be differentiated from that given in the same field in schools of general education? In other words, does the responsibility of the teacher of teachers in a given subject differ from that of a teacher of the same subject in a liberal-arts college? Through a discussion of the development of the idea of the professional treatment of subject-matter and a consideration of the present conditions of that interest, the specific needs of teacher-training are presented (1) as to the needs of teachers—"scholarship, technique, and professional intelligence," and (2) as to the work of teacher-training institutions—the character of the organization of instruction, the more significant phases of faculty organization, and certain details of the administration practice. By comparison and contrast, the author points out, through the discussion of the functioning of the liberal-arts college, the so-called academic normal school, and the purely professional normal school, the achievements and the failures of teacher-training. Among the latter, there is mentioned "the peculiar field of the professional purpose,—the conscious adaptation of instruction to the characteristic responsibilities of public-school teachers and to the typical pressures of their occupations on them." The conclusion is that the achievement in the professionalization of subject-matter has depended upon the professional attitude of teachers of teachers in professional schools; and by the term "professional attitude" is meant that "the teacher of teachers shall be so sensitive to the needs of the service and so well acquainted with the characteristic pressures upon the public school teacher that he will consciously shape his instruction in the interest of both." In the fourth and last chapter, "Some Suggested Applications," an attempt is made to exemplify "professionalized" work in geography, literature, and arithmetic, as "a teachers college would feel bound to illuminate the topics covered in the public school courses of study in its tributary region, and to transcend the treatment given in the best elementary school textbooks."

Criteria for appraising this monograph are not offered in a preface. After his "Acknowledgements," the author proceeds to state the problem *and to make an interpretative analysis of relevant historical* materials. The ten pages of bibliographical notes include materials from a wide range of sources and indicate that the scattered literature on the subject has been carefully assembled. The author, who exhibits the qualities of scholarship and "subtle knowledge" which he insists are essential to the successful professional teacher, has arranged his materials to demonstrate that professionalizing academic materials has been the work of the normal schools; and, in these, only sporadic instances appear. The illustrative materials, calculated to demonstrate principles established in the three earlier chapters, admirably convey the professional ideals of scholarship and method. To the student of this pertinent problem in teacher-training, this work appears as a unique contribution, which should pave the way for efforts to professionalize subject-matter not only in the professional schools but also in the specialized departmental work of other institutions.

EDWIN B. SMITH,
Ohio University.

FREDERIC LYMAN WELLS. Pleasure and Behavior. D. Appleton and Co., New York, 1924. Pp. 274.

If one wishes to study the psychology of pleasure this book will form an interesting introduction. It is to be remembered that it is the psychology of pleasure and not of happiness that is the subject of the work though the author consistently confuses the two; and perhaps deliberately.

The book is strongly influenced by psycho-analytic concepts and takes the "tough-minded" attitude generally. It deals chiefly with instincts and "urges" as in a discussion of "pleasure" it should. The author expresses his view that everyone is working for his own pocket all the time—"just the same (gentle reader) as you are," without adequate recognition of the fact that the gentle reader in working for his own pocket is also working for his author's pocket; and doing so consciously and heartily.

It is a difficult task that the book essays: to present the foundations and growth of the affective life of the individual in its natural and human settings. This involves constant reference to history, anthropology, ethics, physiology and other sciences. It is not strange that exception may be taken to many of the statements in such a composite. And yet for a complete account these and other detailed studies of man are necessary. The problem is in large part one of synthesis. The ethical thinker should be grateful for this pleasant and happy presentation of many important facts. In regard to their synthesis and interpretation he may still hold reservations.

HARRY CHRISTOPHER HUMPHREYS, PH.D. *The Factors Operating in the Location of State Normal Schools.* Teachers College, Columbia University Contributions to Education, No. 142. New York City, 1923. Pp. 152.

This is a valuable study of an important subject; but the title promises both more and less than the study includes. The book deals with the political factor in the location of the normal schools in four states; and with other factors, such as donations from cities or the distribution of existing schools in some eight or ten states. It should be said that there is an appendix composed of excerpts from the laws dealing with the establishment of state normal schools in forty-three states. The study clearly shows the presence and the potency of unworthy determinants of the location of our state normal schools.

What is really a second study not indicated in the title of the book is found in Chapter V. This chapter is entitled: "A Comparative Study of State Normal Schools in Selected States." Four contiguous eastern and one southwestern state are studied, chiefly with regard to the student enrollment and distribution of their state normal school population. This is a significant study and of course bears upon the wisdom of the present locations of the schools in the selected states. But there is no attempt to compare the educational standards, faculties and general effectiveness of the schools themselves. Yet such matters must surely affect the enrollment and distribution of the students; so also must, for example, the age of the school, its advertising policy and the strategy and loyalty of its alumni.

The study eventuates in a theoretical technique for the location or re-location of state normal schools and in several entirely defensible recommendations. While not a definitive treatment this is a worthy beginning of a thorny subject. Some day the location and re-location of state and private universities may be studied. What slight and even ridiculous factors have determined locations may be seen, for example, in the case of Cornell, in the autobiography of President White.

WALTER S. MONROE AND LLOYD B. SOUDERS. *The Present Status of Written Examinations and Suggestions for their Improvement.* Bureau of Educational Research, College of Education, University of Illinois, 1923. Bulletin No. 17. Pp. 77. Price 50 cents.

This very excellent bulletin is just what its title indicates. It is both informing and suggestive. It contains important original studies. It should be carefully read by all teachers. And while none should neglect to ponder, the more unballasted members of the profession should especially try to discover the meaning of the perfectly indispensable reservations tucked into two paragraphs on pages 61 and 62. By and by the newer type of written examinations will find their proper place beside the old. This study should help to hasten that day.

BIRD T. BALDWIN AND MADORAH SMITH. *Educational Research.* Bureau of Education, Washington, D. C. Bulletin, 1923, No. 42.

This is a classified bibliography of 572 titles of research articles published in American educational magazines and a few American books dated from 1920 to 1922 inclusive. Preceding the bibliography there are very brief summaries of the range and conclusions of the studies listed as well as mention of various foundations, experimental schools and periodicals which carry on research, or publish the reports of research.

The definition of research used by the compilers does not include historical and philosophical researches. To historical students it may appear to be some slight consolation that, according to that definition this bulletin itself is not research for it is purely historical.

H. G. GOOD,
Ohio University.

HOMER E. COOPER. *Cost of Training Teachers. A Method of Determining Cost and Its Application in the State of New York.* Warwick and York. 112 pp. Price $1.60.

This book is quite naturally of greatest interest to those interested in the training of teachers in the State of New York. The author has made a very careful study of the cost of training teachers in that state and of the extent to which the state is meeting the problem of supplying trained teachers for its schools.

It is interesting to note that during the period from 1909 to 1921 the highest percentage of all certificates issued going to trained teachers was reached in the four periods from 1911 to 1915. In the period from

1919 to 1921 only 25 per cent of the certificates issued were issued to trained teachers.

The methods used by the author in determining the cost of training teachers and the relation of the supply of teachers to the demand will be of interest to all persons interested in these problems.

A. F. Myers,
Ohio University.

Arthur I. Gates. *Psychology for Students of Education.* Macmillan Company, 1923. Pp. 489.

One would have some timidity in producing a book designed primarily as a text in the psychology of advertising and selling but which might also serve as a text in general psychology where such is needed! Yet, absurd as this would seem in connection with its business applications, psychology is even yet too commonly so treated in its educational bearings. Thus the author in this otherwise excellent book states that, "while the book has been written to satisfy the needs of students of education primarily, it may be found serviceable as an introductory text in general psychology." The pity is that a job so well done could not have been worked out to contribute more directly and more practically to the many problems prospective teachers must face, either with or without the aid they have a right to expect from the psychological instruction so often even forced upon them under the name of educational psychology.

The too common tendency of the past has been for our educational psychology to differ from general psychology in little but name. We have been inclined to feel that a knowledge of the general mental processes, and the ideals of development *in general* is all that is necessary for their proper guidance, or, at least, that with this as a background the teacher can work out the details. The sad thing is that too often the teacher entering his practical work has little but background and that even here the "haze" is the most conspicuous part. He has been trained in the easy generalities and left to struggle through the difficult task of their detailed application unaided.

While we can never, perhaps, hope to duplicate, in our instruction, the actual and specific problems the teacher will face in the field, still the closest approximation to these is desirable. Consequently those writing our texts in educational psychology should be less fearful about omitting many of the time-worn discussions of the general field (important though they may be there) and of searching out and dealing practically and in detail with the most important psychological problems occurring in the actual class room. We must realize more and more that we are training practical teachers, not laying the foundations for future "pure" psychologists. Thus, for example, the text in educational psychology should give us more of the results of practical experimentation and demonstration of how children learn and retain their various number combinations, and of the shortcomings of our teaching of these things in the past and how they might, in the new light, be improved, rather than to spend the time explaining, in abstract and hypothetical neurological terms the formation and retention of those bonds. The field is full of these insistent, practical problems. Why should we not shift the point of emphasis a little from the traditional toward the vital, practical considerations all teachers will have to meet?

It is in the hope that Gates may have taken a bigger step in this direction than examination of his book proves to be the case, that one feels disappointed. Yet comparatively he has done a very good job and the book should be welcomed as a real contribution by the hundreds of instructors looking for the best to be had in this field which admittedly needs a good deal of re-constructing and shifting of emphasis. In addition to the chapters dealing with the customary matters of sensory experiences and their gradual integrations into and with the higher ideational processes, he gives much space to the various phases of the learning process, original capacities, correlation of abilities, intelligence and its measurement, transference of training, teachers grades, etc. which, in their clean-cut treatment, will greatly aid the instructor whose plan is to make these things of real, functional value in the training of teachers for actual, effective work in the field.

F. B. KNIGHT AND G. M. RUCH. *Syllabus for a First Course in Educational Psychology.* Iowa Supply Company, Iowa City, Iowa, 1923.

This manual has been written to supplement Gates' *Psychology for Students of Education.* In the words of the authors, "the lessons and assignments will follow this text closely. In the main each lesson in this syllabus will match a chapter in the text. It is therefore essential that the student spare no pains in the genuine mastery of each chapter. In preparing each chapter the student should be sure to do all that is asked for in the syllabus." It is plain, from the amount of work outlined for each lesson, as well as from the meager references to other sources, that intensive mastery of the text is what is desired. This, perhaps, is a good thing, stressing as it does the *mastery* of something, in the place of the too-common smattering over a broader field, yet it has its inherent dangers, in some hands, of unduly mechanizing or stereotyping the course and of creating the impression that the field of educational psychology and the contents of a book are synonymous.

In substance, the authors claim two general advantages from the use of this syllabus: (1) a great saving of effort and time for instructors who are overburdened with large classes and heavy schedules, and (2) the formation of economical and effective habits of study on the part of students using it. It is probable that anyone examining this syllabus carefully will feel that both of these advantages will be abundantly realized. The student conscientiously making the preparations as directed is bound to carry away from the course, not only many well selected facts but also an increased capacity for effective study, while the one who grudgingly makes his preparations can, with a minimum of trouble to the instructor, be urged into doing a grade of work otherwise impossible.

Probably the most valuable features of the syllabus are the suggestions for study, much at variance with the study concepts and habits of the average college student, yet in keeping with the best and latest findings on the matters of learning and of study. For the sake of brevity some of the more important of these will merely be listed:

First, study of each lesson is to be broken into at least two periods; the first to get the facts from the text according to the syllabus outline for the chapter; the second for the review of these facts after a period of two or three hours have elapsed, and to re-read and correct any work thus found not to be well understood. This is a good start toward a spaced study or repetition seriously lacking in the average student's study program.

Second, in view of the near futility, for permanent retention, of a single reading it is interesting to note, time after time, instructions similar to the following for the study of the various chapters of the text: "(1) Read the sub-topics of the chapter in the table of contents, pp. xiii. Before reading the chapter spend a few minutes organizing what you already know concerning each topic listed on pp. xiii. Take time to frame for yourself questions, on each topic, that you expect the chapter to answer. (2) Read the entire chapter 'for intellectual fun'; i.e., as though you were not to be tested upon your study but wanted to find out the facts for your own satisfaction. (3) Re-read the chapter with the notes (Section II) and the Class Preparation (Section III) in mind." These are the instructions, in part, for the study of Lesson 11 in the Syllabus.

These careful readings, with frequently two re-readings, for the general grasp of the contents of the lesson as well as for the solution of specific problems involved in it, cannot but greatly improve the general preparations, and attitudes toward preparations, of the students doing them. As further incentives to good study, additional work is usually outlined for additional credit, though the exact nature of the additional credit does not seem to be specified.

All through the syllabus are to be found many types of appropriate suggestions, exercises, questions, etc. to be worked out carefully and put in written form in spaces provided for their recording, and in addition to these, a few of the most significant, from the standpoint of the authors, of the questions and exercises following the chapters of the text are indicated for special study and recording in the manual. Not only are these exercises valuable as worthy content in themselves but, to the instructor who desires to add things of his own choosing to suit his special conditions and purposes, they are sources of valuable suggestion. The manual should receive a hearty welcome not only from those already using Gates' *Psychology*, but should open the way for the adoption of that text by others who might otherwise hesitate in taking that action.

HENRY EASTMAN BENNETT. *Psychology and Self Development.* Ginn and Company, 1923. Pp. 206.

According to the author "the selection and rejection of material of this book has been an evolution in the classroom during many years of search for (1) that which will function directly in increasing the student's capacity as a learner; (2) that which will afford the most useful basis for a course in teacher-training; (3) that which will best meet the needs of a first course in college psychology; (4) that which, instead of merely skimming the cream of interest will definitely project the student's interest and expectation toward a fuller and more adequate pursuit of the subject; (5) that which will best help the young student to maintain his poise amid the dizzying enlargements of his mental horizon as he climbs the ascent of higher education and thinks he sees dark chasms yawning between his new knowledge and his old faith."

With these purposes and ideals in mind, "a lot of territory" to presume to cover in so brief a treatise, the author proceeds to express in simple and very readable language the generally accepted facts in the fields discussed, "admitting nothing which is merely argumentative or speculative which is not essential to the scientific integrity of the whole plan or practically applicable to the needs of the learner, and to omit nothing which properly belongs to a thorough first course in psychology. The functional viewpoint and the physiological basis have been woven into every chapter. A close-knit system of treatment has been sought which explains all psychical phenomena in terms of associations and progressive integration and the conditions which forward or retard these."

Anything unusual or of special interest in the book, however, is to be found not in a survey of the table of contents, which is closely similar to that of the traditional introductory psychology, but to special ways of statement or treatment under these heads. The book commences with a chapter on "The Art of Learning" in which some valuable advice on study is given under such captions as, "Learn Strenuously," "Question Constantly," "Organize," "Outline," "Learn to Take Notes," etc., with the reminder that one's practical problem is not to worry about the native ability which has been given him but to make the most effective use of what he has. In the second chapter, under the heading, "The Basis of Learning" is a discussion of the customary facts of elementary neurology. Chapters on "The Original Capital," "Habit," "Sensation," "Concepts," "Judgments," etc., follow. In these the point of view and treatment are usually consistent and up-to-date. For example, in his treatment of instinctive tendencies in man he states, "it is not usually any definite kind of act, but rather a vague tendency to a certain attitude under certain conditions. . . . . Few acts of mature life may be regarded as mainly instinctive, because of the large element of learned activities which inevitably enter into them. Nevertheless, there enter into all conduct of whatever kind some instinctive influences. Back of every thing we do is a cause in the form of that vital push, blind instinct more or less educated to rational efficiency. . . . . Education gives the direction and form to one's acts, but the reason for one's acting at all, the primary thing that makes things go, the real motive power for all conduct, is found somewhere deep below the surface in these instinctive impulses (pp. 35-36)." Most parts of the book are thus very readable and will appeal to the beginning student, and, we believe, give him a desire for more about which he is reading, which cannot be said of all texts in psychology.

The "sins" of the book, if we may mention some of them are rather "sins of omission" than of "commission." One is justly surprised in reading a book purporting to be a text in educational psychology, to find no mention in the index, and practically no mention if any in the body of the text, of such matters as general intelligence, intelligence testing, I.Q., individual differences, statistical methods, correlation, median, mean, etc. These are simply indicative of some of the vital considerations one would expect to find in a text in educational psychology. They are the very tools with which investigation that is worth while must largely be made. Things of almost equal importance have been omitted, from the standpoint of general psychology, so far as modern "moves" are concerned. This perhaps is due in some part to the too-common attempt to cover too much territory, in fields which are much more incompatible than has been imagined, in a treatise of the size of this text.

Yet, in spite of these omissions, the book will be found to be of real value, at least as a supplementary text, for beginning college students.

H. J. PETERSON,
Ohio University.

NEW BOOKS AND PAMPHLETS RECEIVED[1]

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

Anatomical Age in School Children and Its Relation to Mental Development. DANIEL ALFRED PRESCOTT. Psycho-Educational Clinic, Harvard University. Harvard Monographs in Education. Whole No. 5. Series 1, No. 5. Harvard University, Cambridge, Mass.

Brain and Intelligence. BERNARD HOLLANDER. The Ethological Journal, October, 1923. 57 Wimpole Street, London, W. 1. 18 pp.

Cost of Training Teachers. HOMER E. COOPER. Warwick & York, Baltimore, Md. $1.60. 112 pp.

Critical Study of Certain Measures of Mental Ability and School Performance. INEZ MAY NITERER. Warwick & York, Baltimore. $1.80. 141 pp.

Development of a Verbal Concept of Relationship in Early Childhood. MARTIN L. REYMERT. Scandinavian Scientific Press. Sogaten 2, Kristiania, Norway. 83 pp.

Factors Operating in the Location of State Normal Schools. HARRY CHRISTOPHER HUMPHREYS. 152 pp. Teachers College Series, Columbia University, New York City.

How to Teach Handwriting. FRANK N. FREEMAN AND MARY L. DOUGHERTY. Houghton Mifflin Company, New York City. $1.80. 305 pp.

Laboratory Manual in Psychology of Learning. WILLIAM H. PYLE. Warwick & York, Baltimore, Md. $1.50. 161 pp.

Love in Children and Its Aberrations. OSKAR PFISTER. Dodd, Mead & Company 443 Fourth Avenue, New York City. $7.50. 576 pp.

La Neurasthenie. DR. MAURICE DE FLEURY. Librairie Felix Alcan, 108, Boulevard Saint-Germain, Paris. 173 pp.

Mental Training for the Pre-school Age Child. Harr Wagner Publishing Company. San Francisco, 1923. 100 pp.

Personnel Management, Principles, Practices and Point of View. WALTER DILL SCOTT, AND ROBERT C. CLOTHIER. A. W. Shaw Company.

Pleasure and Behavior. FREDERIC LYMAN WELLS. D. Appleton & Co. New York City. 115 pp.

Problems in Psychology. A. J. SNOW. Henry Holt & Co. New York City. 115 pp.

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[1] Mention here does not preclude further comment.

Professional Treatment of Subject Matter. Edgar Dunnington Randolph. Warwick & York, Baltimore. $2.50. 202 pp.

Psychology and Self-Development. Henry Eastman Bennett. Ginn and Company, New York City, 1923. 206 pp.

Psychology for Students of Education. Arthur I. Gates. Macmillan Company, 1923. 489 pp.

Psychology in Theory and Application. Horatio W. Dresser. Thomas Y. Crowell Company, New York City. $3.50. 727 pp.

Rehumanizacion de la Cultura Cientifica par la Psicologia Honorio F. Delgado. Lima, Peru. 79 pp.

Revista de Psiquiatra y Disciplinas Comexas. Hermilio Valdizan and Honorio F. Delgado. Vol. V, no. 1, 1924. Casilla 1589, Lima, Peru. 102 pp.

Special Disability in Algebra. Percival Mallon Symonds. Teachers College, Columbia University, New York City. 88 pp.

Syllabus for a First Course in Educational Psychology. F. B. Knight and G. M. Ruch. Iowa Supply Company, Iowa City, Iowa.

Study in Latin Prognosis. William Sims Allen. Teachers College, Columbia University, New York City. 40 pp.

Teachers' Difficulties in Arithmetic and Their Correctives. Ruth Streitz. Price 30 cents. University of Illinois, Urbana. 34 pp.

Teaching of Latin in High Schools. H. J. Barton and others. University of Illinois, Urbana, Ill. Educational Research Bulletin No. 26. 25 pp.

Tijdschrift Van Den Nederlandschen Werklooshcids-Raad. Anth. Folmer and J. Gerritsz. Bureau: Kloveniersburgwal 70, Amsterdam. 88 pp.

Works of the Institute of Labor at Kharkoff. Kharkoff, Hospital Per. 203 pp.

Written Examinations and Suggestions for Their Improvement. Walter S. Monroe and Lloyd B. Souders. Price 50 cents. University of Illinois, Urbana, Ill. 77 pp.

PUBLICATIONS ISSUED BY THE DEPARTMENT OF INTERIOR, BUREAU OF EDUCATION, WASHINGTON, D. C.

Art Education for Elementary Schools. JANE BETSY WELLING. Industrial Education Circular No. 21. October, 1923. 18 pp.

Consolidated Schools of Bernalillo County, New Mexico. A. MONTOYA. Rural School Leaflet No. 22. 8 pp.

Consolidation of Schools and Transportation of Pupils. J. F. ABEL. Bulletin No. 41, 1923. 135 pp.

Coöperative Education Association of Virginia. GEORGE W. GUY. Bulletin No. 53, 1923.

Child Health Program for Parent-Teacher Associations. LUCY WOOD COLLIER AND HARRIET WEDGWOOD. Health Education No. 5, 1924.

Educational Research. BIRD T. BALDWIN. Bulletin No. 42, 1923. 76 pp.

Educational Tests. STEPHEN S. COLVIN. Bulletin No. 57, 1923. 28 pp.

Free Textbooks for Public-School Pupils. WILLIAM R. HOOD. Bulletin No. 50, 1923. 14 pp.

Games and Other Devices for Improving Pupils' English. W. W. CHARTERS AND HARRY G. PAUL. Bulletin No. 43, 1923. 88 pp.

Health Promotion in a Continuation School. HARRIET WEDGWOOD. School Health Studies No. 5. 25 pp.

Municipal and School Playgrounds and Their Management. J. F. ROGERS. School Health Studies No. 6, January 1924. 22 pp.

Rhodes Scholarships. Higher Educational Circular No. 28, February 1924.

Schools and Classes for Feeble-minded and Subnormal Children, 1922. FRANK M. PHILLIPS. Bulletin No. 59, 1923.

Suggestions for a Physical Education Program for Small Secondary Schools. Physical Education Series No. 3, 1923. 79 pp.

Survey of the Schools of Alexandria, Va. Bulletin No. 56, 1923. 62 pp.

VOLUNTARY MOTOR ABILITY OF THE WORLD'S CHAMPION TYPISTS

WILLIAM F. BOOK

Indiana University

I. PROBLEM

1. Historical—tests previously devised for selecting typists and learners of typewriting

A number of experiments have been made to determine the native characteristics that are necessary for learning to typewrite or to achieve distinction in the practice of this art. Tuttle[1] selected six psychological tests which he believed would measure the psycho-physical processes involved in learning to typewrite: (1) a motor reaction test, (2) a test for rhythm, (3) a test for attention and accuracy, (4) a test of memory span, (5) a directions test, and (6) a substitution test. Three of these tests gave no help whatever for determining, in advance, the student's ability to learn to typewrite. The test for rhythm, and the directions test showed little positive correlation with the progress made in learning to typewrite. The memory span test gave a negative correlation, while the motor-action, the attention and the substitution tests gave a positive correlation ranging from 0.52 to 0.68. Tuttle concludes that the particular abilities measured by the last three tests are required in learning to typewrite because the students who did well on these mental tests also received the highest grades in typewriting. The results of his investigation seem to show that those who made a mark of 80 or above on these particular tests may become expert typists.

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[1] Tuttle, W. W., Tests for determining ability for learning typewriting. Journal Educational Psychology, vol. XIV, March, 1923, pp. 177–181.

Those making a score of 75–79 may become average typists while those making scores below 75 will probably fail in the learning or become very poor typists at best.

Other attempts to devise tests which would aid office managers in selecting applicants for stenographic positions and assist teachers in selecting students who should be encouraged to prepare for this occupation, have been made by H. A. Rogers[2] and Miss Jaqueth, E. R. Hoke[3] and M. A. Bills.[4] Hoke arranged a group of tests which he thought might be used to determine in advance all those who would succeed in learning this art. His scale was composed of seven tests: (1) motor reaction, (2) speed of writing, (3) quality of writing, (4) speed of reading, (5) memory, (6) spelling, and (7) a number-letter substitution test. After making a careful analysis of the work of a stenographer he believed that the same motor and mental functions were employed by a stenographer and typist that were measured by these tests which are now being experimented with to determine their reliability as a scale for selecting prospective learners of this art.

M. A. Bills in two investigations tried to get a reliable basis (1) for selecting applicants for courses in stenography and typewriting who would be successful in learning these arts, and (2) to determine whether it was possible to select, without extensive tryouts, from a group of applicants for stenographic positions those who would be eminently successful. Three types of tests were given to learners, and the ratings made on these tests compared with the progress these same subjects made in learning to typewrite; (*a*) a general intelligence test, the Carnegie Employment VI, (*b*) a series of five tests designed to show special aptitudes in stenography and typewriting, the

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[2] Rogers, Herbert A., Psychological tests for stenographers and typists. Jr. of Applied Psychology, vol. I, pp. 268–274.

[3] Hoke, E. R., Prognostic Tests of Stenographic Ability. The Gregg Publishing Co., 285 Fifth Ave., New York City.

[4] Bills, M. A., Method for the selection of comptometer operators and stenographers. Jr. of Applied Psychology, vol. V, pp. 275–283. Also: A test for use in the selection of stenographers. Jr. of Applied Psychology, vol. V, p. 373f.

Carnegie Employment VIII, (c) a will profile test designed to measure motor inhibition, speed of decision and perseverance.

Miss Bills in her experiments with these tests found that the general intelligence test was most valuable for eliminating failure both among prospective learners and among candidates for a position. Eighty-six per cent of the failures could by this means be selected in advance and eliminated on the basis of the ratings made on this test. Parts one and five of the special ability tests proved most helpful for selecting candidates for positions who would be certain of success, the reliability of the prediction being 67 per cent for part 5 and 69 per cent for part one.

The same intelligence test was later given to three groups of successful stenographers and the ratings made on the test compared with the rankings given these same individuals by their employers when judged on the basis of their worth to the firm. For 20 stenographers from different business firms the correlation between the scores made on the intelligence test and their stenographic efficiency, as judged by their employers, was 0.75. The correlation between rank on the intelligence test and the ratings given by certain other business firms to 17 very successful stenographers and 6 secretaries was 0.92. And for 14 other stenographers selected from five different firms because they were said to be their best stenographers, the results made on the mental tests were even more diagnostic and positive in their prediction.

When this same intelligence test was given to a group of prospective learners of stenography and typewriting in a technical high school and the ratings made on the test compared with their actual success in learning to typewrite, as evidenced by their school grade in this subject the following January and June, the results were found very helpful for selecting in advance the pupils who would actually succeed in learning this art. Most of those who made a score of 60 or more on the intelligence test succeeded in learning stenography and typewriting and were promoted the following January and June. But 5 individuals who made a score of over 60 on the intelligence test failed in the course in stenography and typewriting both in January and June. Four others succeeded in January but failed in June, and 4 more failed in January and succeeded in June. Two students who made scores *below* 60 on the intelligence test succeeded in their typewriting work both in January and in the examination in this subject the following June.

The fact that most of the students who failed in learning these subjects made a score below 60 on the intelligence test and that a large majority of those who made a score above this point were successful in learning this subject shows that general intelligence, or the group of functions measured by this test, is an essential factor in producing success in learning to typewrite. But the other facts revealed, namely, that a large proportion of the individuals who were able to make high scores on the intelligence test did not succeed in learning stenography and typewriting and that certain other individuals with lower intelligence scores *did succeed* in learning this art, indicate that other abilities not measured by this intelligence test are necessary for acquiring skill in practicing and in learning this art.

2. *Purpose of the present experiments*

It was the purpose of the experiments here reported to determine what some of these necessary abilities for learning to typewrite are. Most of the prognostic and special ability tests that have been used to select stenographers[6] and learners of typewriting have been made up of the same psychological tests that are regularly used in constructing the more reliable intelligence scales. But such facts as those quoted above indicate that other abilities than those measured by an intelligence test are necessary for attaining the highest efficiency in learning and in practicing this art. The fact that most of the successful stenographers tested by Bills rated so high in general intelligence does not preclude the possibility of their possessing certain other characteristics not measured by an intelligence test which are nevertheless necessary for attaining the highest degree of success in typing and in learning to typewrite.

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[6] Compare the author's Psychology and Pedagogy of Skill, Chapter XXII.

One such ability the writer believed might be a subject's voluntary muscular control, or general motor ability. If this were an essential factor for successful typing and for learning to typewrite, it was believed that it would be markedly present in the world's champion typists who have demonstrated the fact that they possess superior skill in typing by winning one or more international typewriting contests. To test this hypothesis and because the writer had access to norms for such voluntary motor control, for all age groups from six to seventy-five, he decided to give the Bryan motor control tests[6] to all contestants in the last International Typewriting Contest held in New York City, October 22, 1923.

II. METHOD

1. Tests used for determining the voluntary motor ability of the World's champion typists

The method used for determining the voluntary motor ability of these champion typists was that employed by W. L. Bryan in his study of the Development of Voluntary Motor Ability in children from six to sixteen years of age in the Worcester, Mass., public schools,[6] except that we used a more improved method of recording the rate at which the various types of movements studied could be made. Instead of the devices used by Bryan we used a special apparatus consisting of a telegraph key connected electrically with a Hollerith Electric Speed Counter[7] which recorded the number of movements our subjects made in five seconds.

In obtaining these records of voluntary motor control over certain groups of muscles, several trial records were taken with each subject for each type of movement measured, to accustom the subject to the apparatus and to insure uniformity in technique. Three or four trials were then taken to insure that the subject was performing at his maximum rate. These trials invariably resulted in giving the same rate when the conditions were accurately controlled. The best rate made by each subject in these trials was recorded on special cards, as the measure of the subject's voluntary motor control, for each movement studied.

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[6] Bryan, W. L., On the Development of voluntary motor ability. Am. Jr. of Psy., vol. V, December, 1892, pp. 1–80.

[7] This apparatus was specially arranged and adapted for this type of measurement by Thomas E. Nicholson, Assistant Professor of Psychology at Indiana University and is being used by him in an unpublished study of the decline of voluntary motor ability with increase in age.

Four different types of movement were measured for *each arm* and *hand:* (1) the rate per second at which these subjects could move their forefinger when the hand and arm were held in a definite and uniform way; (2) the rate at which they could move the hand using the wrist as a hinge; (3) the rate and regularity with which they could move the forearm from the elbow joint, not moving the wrist; (4) the rate at which they could move the upper arm using the muscles of the shoulder and upper arm. The apparatus used to record the rate of movement was manipulated and the directions given to the subjects by Mr. Nicholson and the writer; the time was taken by a stop watch.

These tests and conditions were identical with those used by W. L. Bryan in his study of the Development of Voluntary Motor Ability and more recently by Thomas E. Nicholson, Assistant Professor,[8] and Claude Campbell, graduate student in psychology at Indiana University, in an unpublished investigation carried on during the past three years to determine the decline in Voluntary Motor Ability with increase in age. In Nicholson's study more than 3000 subjects have been tested with these same tests, 25 males and 25 females for each of the ages sixteen to seventy-five. These records give us the norms with which the score made by each contestant in the last international typewriting contest, were compared.

Accurate records of the degree of voluntary motor control possessed by each of these subjects were then obtained by means of these tests from each contestant in the world's professional, amateur, novice, the school championship and school novice classes. The records made by these contestants on each of the eight types of movement described above and by five ex-world champion typists were then compared with the norms obtained from the unselected individuals of corresponding ages, tested by Mr. Nicholson and our assistants.

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[8] The writer is indebted to these co-workers for the use of the norms which they have been establishing for these tests and to Mr. Nicholson for assistance in giving the tests in New York.

2. *Subjects tested and method of giving the tests*

The subjects tested (48 cases in all) were the winners in more than 80 state and district contests throughout the world and had thereby earned the right to compete in the nineteenth annual international typewriting contest held in New York City in connection with the annual business show. These contestants were divided into five classes: professionals, amateur, novices, world's school novices, and world's school class. The professional and amateur class is open to any contestant in the world and a thousand dollar trophy cup and a gold medal is awarded to the winner of the contest. The professionals write for one hour, the amateurs for thirty minutes and the novices and school classes for fifteen minutes each. All write from the same copy under very strict rules which govern each feature of the contest.

In addition to these persons who took part in the 1923 International Contest we obtained a complete record on the motor ability tests from *five ex-world champions* who had held the world's record as champion typists from one to four years. We also obtained a complete record from Bessie Reeves who gives public demonstrations of speed typing throughout the country. In addition we tested 65 students studying typewriting in the school of commerce and finance at Indiana University during the present college year and compared their records in voluntary motor control with the norms for their corresponding age and with their ability to learn this subject, as measured by their teacher's rating on this point made according to a specially devised rating scale, and by the semester grades made in this subject by each of these students in January and June.

The motor ability tests given the contestants in New York were administered to some of these subjects in a special room adjoining the contest room, after the contest, October 22, 1923. Most of the subjects were tested in the rooms of the Education Department of the Underwood Typewriting Company on the two days following the contest. Many of these contestants were tested two or three times so that we would know that a normal record had been obtained. Mr. Tangora, the present world champion and Mr. Hossfeld, the world's champion typist for the past four years were each tested at three different times. Two tests were given the day following the contest, one in the morning, the other in the afternoon; the third test was given the second day after the contest.[9] It is worthy of note that these records were identical in the three tests. It has been found in our own and in Mr. Nicholson's experiments that a subject does not vary his voluntary motor control record for the groups of muscles we tested if he is in normal physical condition and if the conditions of the experiment are kept uniform.

III. RESULTS

Voluntary motor ability of the champion typists of the world

The results obtained in these experiments are given in the following tables and curves and show that for all the subjects who took part in the last international contest the record made on the motor ability tests by each of these champion typists far exceeds the average record made by the corresponding age group of unselected individuals tested during the past three years by Nicholson and our research assistants. Also that the superiority of these champion typists is consistent for each of the eight groups of muscles tested and that the most skilled typists in every case make the highest rating on the motor ability tests. The letters on the horizontal lines of the figures represent in every case the type of voluntary motor control or movement measured, i.e., F for the forefinger, W for wrist, E for elbow, S for shoulder movements.

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[9] The writer wishes to acknowledge his great indebtedness to Mr. J. N. Kimball, director of the International Contests for permission to give the tests; and to Mr. Symmonds, educational director of the Underwood Typewriter Company, and to Wm. F. Oswald, ex-world champion typist for interesting the contestants in the experiment and for arranging matters so it would be possible to obtain a reliable record for all individuals taking part in the International Contest. Special and very grateful acknowledgements are due the contestants for their sympathetic coöperation and help.

A careful inspection of these tables and curves reveals the following facts:

1. That the present world champion typists, Albert Tangora and George Hossfeld, made the highest record on the motor ability test, their record being *far* superior to all other contestants including the five ex-world champion typists whom we tested. Their nearest competitor was Fred Jarrett, the champion typist of Canada and one of the contestants in the professional class for 1923 who dropped out of the contest.

2. That the ex-world champions, taken as a group, rank only slightly below the present world champions in voluntary motor control.

3. That all members of the professional group in the last world contest rank far above the norms for their respective ages in voluntary motor control and above the contestants in all other classes. The professionals rank above the amateurs; the amateurs above the novices, etc.

4. That this superiority holds for each of the eight measurements taken.

5. That the subjects in the professional group arrange themselves in a regular descending order, on the motor ability tests, beginning with the world's champion typists and ranging downward to the slowest and most inefficient contestant in the professional group.

6. That the world's most expert typists show their greatest superiority in voluntary motor control over their corresponding age norm, in the elbow and shoulder movements and are superior in the movements for the left hand (compare especially tables

1 and 2, and figure 1). It is also significant that the mean variation is less for the left hand than for the right.

7. That even the school novices and school champions show a relatively higher degree of superiority in voluntary motor control over their age norms in the elbow, shoulder and left hand movements than in the movements of their fingers and wrists (compare tables 6 and 7, B).

8. Lastly that the average deviation for those taking part in the last world's typewriting contest in every class is lower than for the group which makes up their corresponding age norm. For example, the M.V. for the forefinger movements of the contestants in the professional and ex-world championship classes combined was 2.81 for the right hand, and 2.50 for the left hand. For the same finger movements in the amateur class, where the variations in age are less, the M.V. was 2.30 for the right hand and 2.20 for the left. The average deviations for the various age groups which constitute our norms (ages twelve to fifty-two) varies from 3.50 the lowest average deviation for any age group to 5.40 the highest.

TABLE 1

Per cent superiority over corresponding age norms (professional and ex-world champions)

NAME OF CONTESTANT	SUPERIORITY IN RIGHT HAND	SUPERIORITY IN LEFT HAND	NUMBER WORDS CORRECTLY WRITTEN PER MINUTE
Albert Tangora	32.1	28.6	147
George Hossfeld	33.1	41.2	146
Bessie Friedman	17.9	20.0	143
George Gaskill	13.9	20.4	137
Wm. F. Oswald	17.0	15.1	141
*Fred Jarrett	30.0	32.4	
Emel A. Trefzger	25.1	27.9	120
Average present champion	32.1	28.6	147
Average ex-world champion	25.0	27.0	136

*Did not finish contest.

TABLE 2

Per cent of superiority over corresponding age norm in each measurement (professionals and ex-world champions)

CONTESTANT	RIGHT HAND				LEFT HAND				NUMBER CORRECT WORDS PER MINUTE
	Fore finger	Wrist	Elbow	Shoulder	Fore finger	Wrist	Elbow	Shoulder	
Tangora	7.0	26.3	36.4	58.8	13.3	16.3	38.9	45.8	147
Hossfeld	41.4	38.2	51.7	1.3	51.9	45.1	48.8	19.1	146
B. Friedman	13.8	28.2	18.6	11.1	21.2	20.1	18.3	20.4	143
Gaskill	14.5	20.4	6.9	13.7	26.7	28.3	8.8	18.0	137
Oswald	11.8	21.7	32.2	2.3	16.1	17.4	8.6	18.2	141
Jarrett	39.3	39.2	11.4	32.8	38.1	31.7	23.6	36.4	
Trefzger	22.8	29.2	19.2	29.1	26.5	20.2	27.5	37.6	129
Average entire professional group (1923)	19.2	28.3	28.4	21.2	28.3	27.4	28.7	25.8	143
Average present world champions	24.2	31.5	44.0	30.0	32.6	30.7	43.8	31.0	146.5
Average ex-world champions	24.3	30.5	20.9	21.4	26.9	23.1	19.9	30.7	135
Average amateurs	11.5	11.2	6.6	8.7	16.6	21.6	13.5	16.0	124
Average world school champions	13.4	17.1	14.8	22.6	8.9	3.4	13.0	12.9	70

TABLE 3

Per cent of superiority over corresponding age norms (amateurs)

NAME OF CONTESTANT	SUPERIORITY IN RIGHT HAND	SUPERIORITY IN LEFT HAND	WORDS WRITTEN PER MINUTE
Regelmeyer	7.2	16.3	143
Stapert	14.6	18.7	139
Pitisan	10.8	9.0	131
Neuenhaus	7.7	15.1	131
Wright	21.1	30.0	110
F. Reeves	−2.6	3.0	110
Greenburg	19.3	12.1	109
†Kingsbury	17.4	28.3	123
Average	12.3	16.6	124

TABLE 4

Per cent of superiority over corresponding age norms in each measurement (amateurs)

CONTESTANTS	RIGHT HAND				LEFT HAND				WORDS WRITTEN PER MINUTE
	Fore finger	Wrist	Elbow	Shoulder	Fore finger	Wrist	Elbow	Shoulder	
Regehmeyer...........	14.0	15.3	0.0	0.0	21.4	16.6	20.1	6.8	143
*Stapert...............	−21.9	−19.1	−12.7	−3.6	7.8	45.6	11.8	7.9	139
Pitisan	5.8	14.9	11.7	10.4	14.7	11.5	5.8	4.3	131
Neuenhaus............	5.7	8.1	4.1	13.6	17.8	10.7	7.1	26.3	131
I. Wright.............	45.4	27.7	15.6	17.8	39.1	32.0	28.8	20.1	119
F. Reeves.............	−1.8	0.5	−2.5	7.1	3.9	5.4	5.7	7.9	110
S. Greenburg..........	25.7	18.3	10.1	24.1	3.1	22.7	14.0	9.0	107
†Kingsbury...........	19.0	23.9	20.7	0.6	25.4	27.7	14.9	45.9	123
Average............	11.5	11.2	6.6	8.7	16.6	21.6	13.5	16.0	

*Strongly left handed.

†Winner of fourth place in amateur group in 1922 World's Contest; did not compete in 1923.

TABLE 5

Per cent of superiority over corresponding age norms (world school champions)

NAME OF CONTESTANT	SUPERIORITY IN RIGHT HAND	SUPERIORITY IN LEFT HAND	WORDS WRITTEN PER MINUTE
Emily Jones.....................	16.4	14.0	91
Pearl Wells.....................	12.9	4.0	87
Julia Pilkonis....................	16.6	10.8	59
Helen Peterson.................	27.7	15.0	58
Helen Johnson..................	11.4	4.0	53
Average......................	17.0	9.6	70

TABLE 6

Per cent of superiority over corresponding age norms in each measurement (world school champions)

CONTESTANT	RIGHT HAND				LEFT HAND				WORDS PER MINUTE
	Fore finger	Wrist	Elbow	Shoulder	Fore finger	Wrist	Elbow	Shoulder	
Jones	11.8	19.6	5.1	29.0	1.3	5.0	27.6	22.1	91
Wells	0.0	29.2	14.5	7.8	2.6	3.5	6.6	3.4	87
Pilkonis	9.9	6.7	22.8	26.9	16.1	1.0	15.9	10.2	59
Peterson	27.1	19.7	29.6	34.6	19.8	6.0	12.3	22.0	58
Johnson	18.2	10.6	2.1	14.6	4.8	1.6	2.8	6.8	53
Average	13.4	17.1	14.8	22.6	8.9	3.4	13.0	12.9	70

TABLE 7

Per cent of superiority over corresponding age norms in each measurement (world novices and world school novices)

CONTESTANT	RIGHT HAND				LEFT HAND				WORDS PER MINUTE
	Fore finger	Wrist	Elbow	Shoulder	Fore finger	Wrist	Elbow	Shoulder	
A, World novices									
Wm. Callahan	17.4	5.3	10.0	1.0	18.5	15.4	4.2	0.37	94
Lucile Kelley	0.3	0.6	−8.1	2.6	−2.6	5.4	−3.2	−0.35	92
Rose Freda	−3.0	−7.3	−2.2	1.2	−0.6	−9.3	0.0	6.8	90
F. Taylor	−6.1	−12.9	−10.6	1.2	10.5	12.6	3.1	0.0	70
Average	−2.2	−3.8	−2.7	1.5	6.4	6.0	1.0	1.7	86
B. World school novices									
Sylvia Siegle	6.5	10.0	26.3	30.7	−2.6	16.6	19.5	25.9	46
Sarah Furnham	3.1	3.5	12.6	23.1	6.7	−1.0	8.7	2.3	34
Average	4.8	6.7	19.4	26.9	2.0	7.8	14.1	14.1	

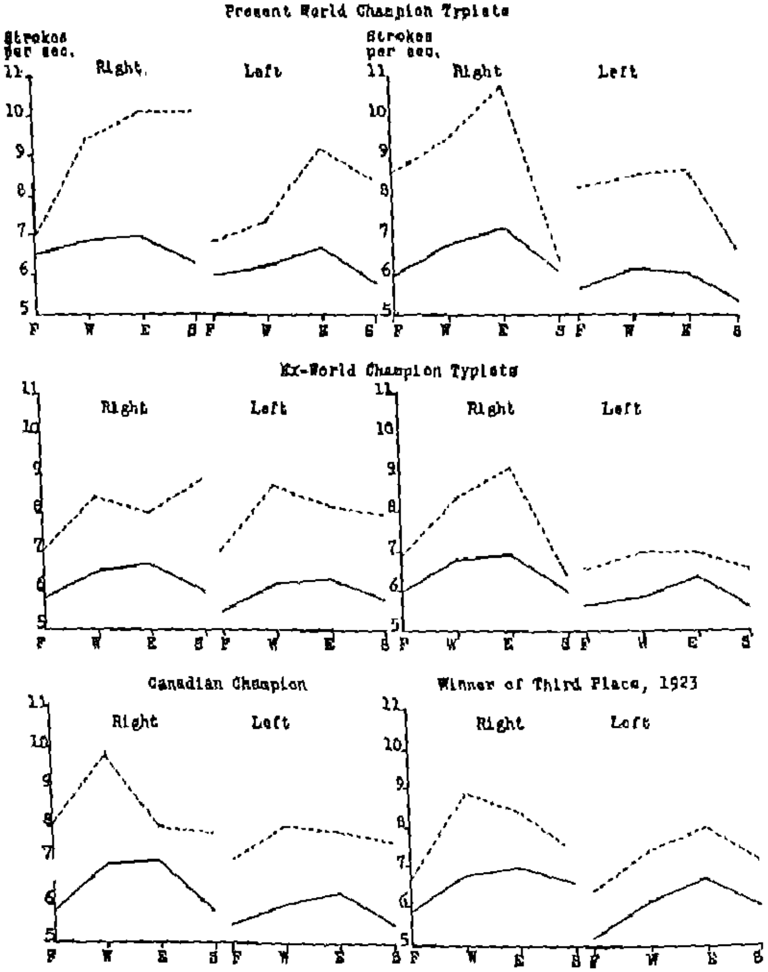

Fig. 1. Superior Voluntary Motor Ability of World Champion Typists
Age Norm ———
Individual Record ------

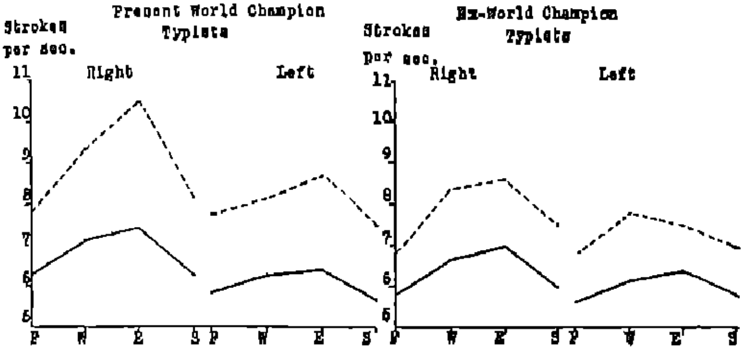

Fig. 2. Average superiority in voluntary motor ability of world champion typists

Age Norm ———
Average Record -----

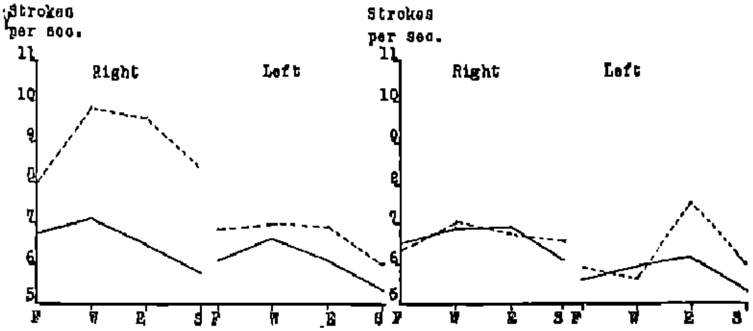

Fig. 3. Voluntary motor control of Bessie Reeves and her sister Florence

Age Norm ———
Individual Record -----

World School Champions

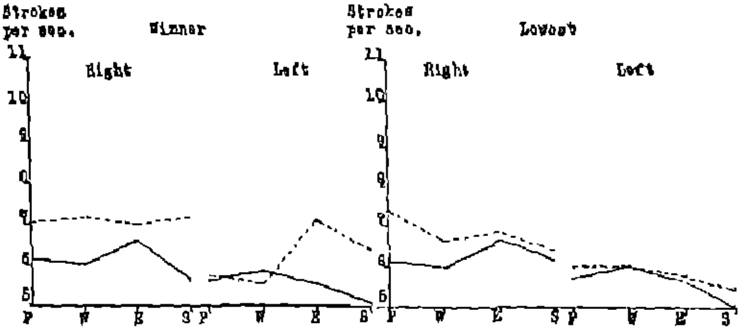

Fig. 4. Voluntary Motor Ability of World School Champions
Age Norm ——
Individual Record - - - -

World Novice Class

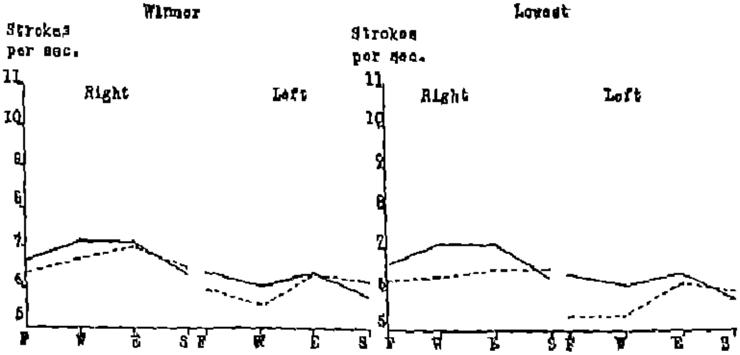

Fig. 5. Sample record of voluntary motor ability of world novice class
Age Norm ——
Individual Record - - - -

IV. INTERPRETATION OF RESULTS

These results obtained from the world's champion typists might of course mean that a part or all of this increase in voluntary motor control had been developed by the practice of these expert typists during the many years that they had been preparing for this contest. Some items in our results suggest such an interpretation. For example, the marked increase in motor control of the left hand over the regular age norm for this hand, and the great superiority of the individuals belonging to the professional group over the amateur contestants and the latter over the novice class and these over the beginners, etc. On the other hand the fact that no group of muscles was tested that is used in actual typing, and the further fact that certain individuals were found among the 3000 cases that make up our age norms for these motor ability tests, who made scores on the tests practically as high as those made by the world's champion typist, would argue that the marked increase in voluntary motor ability shown by the scores made by these world champions is innate and a necessary factor in acquiring the exceptional skill in typing which they possess. This hypothesis was further strengthened by the fact that some individuals belonging to the world's novice class (compare table 7, A) possess only a normal amount of voluntary motor control. The fact that a few individuals were found among these less skilled contestants who did not possess unusual voluntary motor control while no such individuals were found among the contestants who exhibit a much higher degree of skill in typing, is significant. The skill that these novices have attained is still very meager as compared with that possessed by the professional and amateur groups. It might therefore be concluded that these less skilled individuals who possess only an average amount of voluntary motor control will not be able to increase their typewriting skill much beyond their present rate of writing or above the level of skill possessed by the average professional typist.

This hypothesis is borne out by the fact that one contestant in the amateur class this year, who ranked only slightly above her age norm in voluntary motor control has been practicing for more than a year in a school for speed operators where she made consistent and rapid gains up to a certain point in response to the special training. But she had only attained the slow amateur score of 110 net words per minute when her training ceased.[10] While her sister who made a very high rating on the motor ability tests has given public demonstrations of speed writing throughout the country using a method all her own, involving the use of only four fingers and a mental control built up by the mastery of an enormous English vocabulary acquired according to a method invented and taught her by her father, which aids her tremendously in controlling the sequence of the individual letter-making movements (compare figure 3 above).

1. *Voluntary motor ability of beginning and experienced typists compared*[11]

To try to determine whether the marked motor ability of these world champion typists, shown by our results, was innate and a necessary factor in producing this superior type of skill or whether it was acquired as a result of their practice, the following additional experiments were made during the year.

All the students studying typewriting in the school of commerce and finance at Indiana University, 65 in number, were given the voluntary motor ability test early in the year and a comparison made between the record made on these tests by the students who were just beginning the study of typewriting and the record made by those who had been studying this subject for three or four semesters.

The results show that practice in typing has little or no effect on raising the score that an individual can make on the

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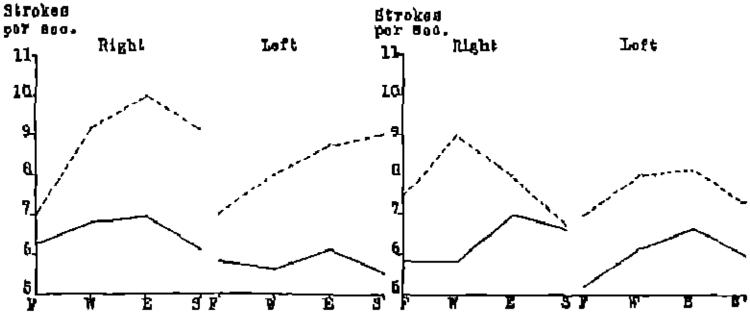
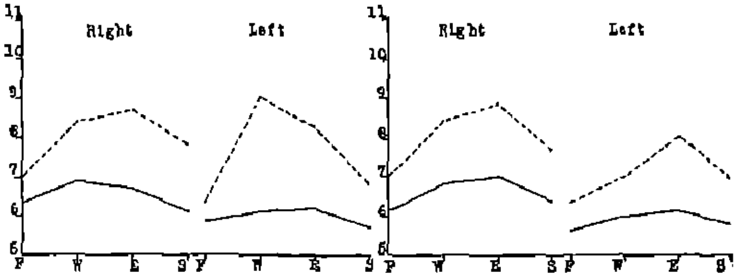
[10] Her highest contest record yet attained is only 110 words per minute. Compare curves in figure 3 above.

[11] The writer is under great obligation to Miss Lula Westenhaver, head of the Commercial Department in the School of Commerce and Finance, Indiana University, for the opportunity of making these and the following experiments and for much valuable assistance in obtaining the data on ratings and accurate grades in the typewriting courses.

Experienced Typists with Superior Typing Ability



Beginning Typists with Superior Typing Ability



Beginning Typists with Inferior Typing Ability

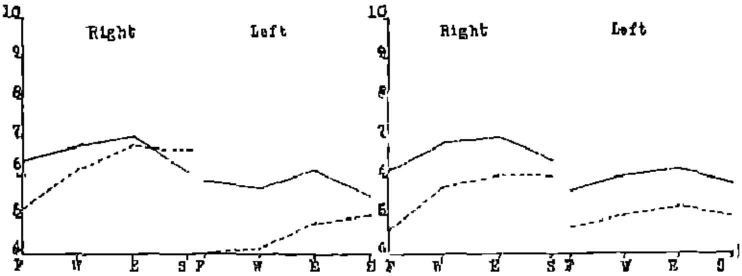


Fig. 6. Voluntary Motor Ability Records of learners of typewriting

Age Norm ————

Individual Record - - - - -

motor ability tests. The average score made for both hands by the 41 beginners in these typewriting classes was 31.6 movements in five seconds, or 6.32 movements per second. The average record for both hands made by the 24 students who had had three or four-semesters' training in typewriting was practically the same, 31.9 movements in five seconds or 6.38 movements per second. The slight increase for the more experienced typists, if it has any significance at all, might easily be accounted for by the fact that some individuals drift into the beginning classes each year who drop out at the end of the first or second semester because they fail in the course and cannot do the work. That this regularly occurs is shown by the fact that the voluntary motor ability of the failures this year, of which there were several, was found in every case to be below the norm for their corresponding age group (compare figure 6 above).

TABLE 8

Average number of strokes made on the motor ability tests by beginners and experienced typists compared

VOLUNTARY CONTROLS MEASURED	RIGHT HAND					LEFT HAND					AVERAGE BOTH HANDS	CASES
	Fore finger	Wrist	Elbow	Shoulder	Average	Fore finger	Wrist	Elbow	Shoulder	Average		
Experienced typists....	31	35	37	32	33.7	28	31	33	29	30.2	31.9	24
Beginners..............	30	35	36	31	33.0	28	31	33	29	30.2	31.6	41

The detailed record for each hand and type of movement studied is given in table 8, both for the group that began typewriting during the college year 1923–1924, and also for those who had had three or four semesters' instruction and practice in this subject when the tests were given. These data suggest that the marked increase in voluntary motor ability possessed by the champion typists of the world was not produced by the practice in typing which these individuals had indulged in but that it is a necessary native characteristic that enables them to acquire the remarkable degree of skill which they possess.

2. Correlation between voluntary motor ability and ability to learn typewriting

In order to secure data that would throw still further light on the importance of the factor of voluntary motor control for the acquisition of skill in typing, a study was made to determine whether the students studying typewriting in the school of commerce and finance and possessing the highest grades of voluntary motor control were actually advancing *more rapidly* in learning this subject than were those who had made the lowest ratings on the motor ability tests. In other words are those who made the highest ratings on the motor ability tests the best typists and adjudged to be the most rapid learners of this art by their teachers?

Fifty-five students studying typewriting at Indiana University the first semester continued the study throughout the year and were ranked by their teacher on the basis of ability to learn typewriting near the close of the year and these ratings compared with the scores made on the motor ability tests. These comparisons gave us the following results. The 22 students ranked *superior* and *very superior* in this regard made an average of 31.3 strokes for each hand in five seconds on the motor ability tests, or 6.3 strokes per second. The 17 students ranked *good* by their teacher averaged 31 strokes in five seconds or 6.2 strokes per second. The learners rated *poor* in ability to learn typewriting made an average of only 29.1 strokes for each hand or 5.8 strokes per second. It is also noteworthy that all the students rated very superior and superior in ability to learn this subject all earned A's and B's on their semester's work in typewriting.[12] Those who were judged poor in ability to learn this subject made grades of D or F, D being the lowest passing grade and F meaning a failure in the course.

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[12] These grades were made up from their individual record sheets for the semester to show their real progress in learning to typewrite. The rankings in ability to learn were made independently of a knowledge of these grades.

3. Correlation between voluntary motor ability and semester grades in the typewriting course

If we compare the ratings made on the motor ability tests with the semester grades made in this subject we get a still closer correlation between ability to learn typewriting and the voluntary motor ability of these learners. In practically every individual case those given a term mark of A made a higher rating on the motor ability tests than did those earning a mark of B. Those earning B for their semester's work made a higher rating on the motor ability tests than did those earning a C, and the latter a higher rating than those who failed in the course. These data are shown in table 9 below.

TABLE 9

Comparison of voluntary motor ability records with semester grades in typewriting

SEMESTER GRADES EARNED IN TYPEWRITING	A+	A	A–	B+	B	C–	FAILED	TOTAL
Average strokes for both hands	33.0	32.4	31.8	32.7	30.4	28.0	26.8	
Total cases in group	6	7	7	8	6	6	4	42

4. Ability to learn typewriting of the students who ranked highest and lowest on the voluntary motor ability tests

The above results are further strengthened by a study of the success made in *learning* typewriting by the individual students who ranked farthest above and farthest below their respective age norms on the motor ability tests. The former were regularly rated superior and very superior in ability to learn typewriting, by their teacher. They also made a superior grade in this subject throughout the college year. The latter were rated "poor" in ability to learn this subject and either failed in the course or made a very low mark for the semester as the following record for the three lowest and the four highest cases among these 55 students show.

INDIVIDUAL STUDENTS	AVERAGE SUPERIORITY OVER AGE NORM	AVERAGE SUPERIORITY BELOW AGE NORM	SEMESTER GRADE IN TYPEWRITING	TEACHER'S ESTIMATE OF ABILITY TO LEARN TYPEWRITING
a	7.4		A+	Superior
b	11.7		B+	Very superior
c	6.3		B+	Good
d	8.8		A−	Superior
x		−4.3	Failed	Poor
y		−4.4	Failed	Poor
z		−5.1	C−	Poor

V. SUMMARY OF FINDINGS AND DISCUSSION OF RESULTS

The data obtained in this study reveal the following significant facts:

1. That the world's champion typists possess an exceptionally high degree of voluntary motor control and that this superiority holds for each of the eight sets of voluntary muscles tested.

2. That this same superiority in voluntary motor ability is found among the ex-world champion typists and was present among all the contestants in the last International Contest in almost direct proportion to the skill in typing which each displayed.

3. That there is a greater consistency in voluntary motor control among the members of these various contest groups than is found among unselected individuals of corresponding ages, suggesting that all individuals who do not possess such high degrees of voluntary motor control were eliminated in previous contests.

4. That the increased voluntary motor control possessed by these expert typists was not developed by practice in typing because the group of beginners studying typewriting at Indiana University in 1923–1924 possess as much voluntary motor control as the experienced typists in the same school.

5. That those who possess the highest grades of voluntary motor control improve more rapidly in learning this art than do those possessing the lower grades of voluntary motor ability, shown by the fact that they made better grades in the subject

and were adjudged by their teacher to be better able to profit by the instruction given them and by the work of the course.

6. That the students in the typewriting classes who ranked farthest above their respective age norms in the motor ability tests, made A's and B's on their year's work in this subject and were judged by their teacher to be superior and very superior in ability to learn typewriting, while those who fell farthest below their respective age norms on voluntary motor ability were rated as very poor in ability to learn this subject by their teacher and either failed in the course or made the lowest passing marks.

7. That the present and ex-world champion typists possess an unusual amount of voluntary motor control in the forearm, shoulders, and left hand and arm.

We may conclude that the type of voluntary motor control called for by the motor ability tests used in these experiments is an essential characteristic for attaining the highest levels of skill in typing. Also that these tests might be used to select subjects for the special schools which seek to develop and train speed operators, and by teachers to select learners for this subject who would succeed in learning the art, and to reject those who would fail to profit by the instruction given. It would be easy to establish a critical score that should be possessed by everyone who desires to take up stenography and typewriting as a life occupation and by those who might attain pre-eminent success.

It also is evident from our results that an unusual amount of voluntary motor control in the left hand and arm is needed to attain the highest degree of success in typing. This is indicated by the fact that such superior control in the left hand and arm is present in all individuals that have achieved the greatest success in typing and in learning to typewrite, and by the fact that the mean variation for the left hand movements is less for all these contestants than it is for the right. This superior control in the left hand is probably required because the present arrangement of the keyboard and the standard method of fingering taught in the schools places a greater load in typing on the left hand than on the right.[13]

The tests should, therefore, prove valuable as an aid to giving wiser educational and vocational direction to students who expect to make stenography their life occupation, and should prove especially valuable to directors of schools for speed operators in selecting subjects who can succeed and in checking up on the characteristics that are required to further raise the world's record in this type of skill. The first and most necessary step in training future champions in this field is to select those who possess the characteristics that are required to develop still higher levels of skill than any yet attained. At present the directors of these schools cannot determine, except by actual trial, which of their subjects will be capable of developing the higher levels of skill required to surpass the present world record for accuracy and speed in typing. The results of our experiments clearly show that such information might be provided in part, at least, by the application of the motor ability tests used in these experiments. It is difficult to estimate the amount of waste that might be eliminated if such methods of measurement were used to select learners for this occupation and art.

It must, however, not be concluded that a superior degree of voluntary motor control is the only necessary characteristic that a superior typist must possess. That other characteristics are helpful or even necessary is shown by the fact that so many of those who rate high on an intelligence test make such eminent success in typing and in learning to typewrite. The task of typing involves much more than the ability to initiate and control certain voluntary movements. Certain psychological functions involved in the mental control over the sequence of the *groups* of movements that must be made to write the words in typing seems to be an important factor in attaining the highest success in typing. Such elements in a typist's skill may perhaps be roughly measured by an intelligence test. But whether they are or not they must, the writer believes, be reckoned with by those seeking to develop future world champions and by those desiring to develop and standardize tests that will determine in advance a subject's true capacity for learning this art.

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[13] E. R. Hokes, The improvement of speed and accuracy in type writing. Johns Hopkins Studies in Education, No. 7, pp. 20f.

The fact that other characteristics are helpful or even necessary for attaining the highest levels of achievement in learning to typewrite should, however, not be allowed to obscure the importance of the results reported above, which show that an unusual degree of voluntary motor control is a necessary factor for attaining the highest levels of success in typing and in learning to typewrite.

THE IMMEDIATE AND LONG-TIME EFFECTS OF CLASSICAL AND POPULAR PHONOGRAPH SELECTIONS

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An important issue before the American musical public today is that of classical versus popular music. In the public schools, where the phonograph has become a recognized part of educational equipment; in the home, where some form of musical activity is coming to be the almost invariable rule; and even in the concert hall, the battle of classicism and jazz, like that of good and evil, is being fought daily. Extreme supporters of one tendency or the other tend to range themselves in opposing camps, and the fight is waged on the one hand with the moral purpose of ridding American culture of an alleged curse of degeneracy, and on the other with the cheerful determination to make clear the meaning of freedom in a democratic society.

The moral implications that have been read into this aesthetic controversy have produced more heat than light. As long as it remains a question of personal prejudice we shall never have a clear or a satisfactory solution. It remains for experimental psychology to make its contribution toward the solution of the problem by an analysis of some of the more important factors, and by an impartial statement of any general tendencies which are to be attributed to either type of music. Here is a large, *important, and practically unexplored territory inviting scientific* psychology to attempt the conquest.

The experiment here reported was suggested by the commonly observed fact that a piece of so-called "jazz" music ordinarily has a more immediate appeal to a mind that is musically undeveloped than does a piece of the sort that would be played at a symphony concert. Not only is this true, but experience seems to show that attempts at direct suppression of jazz interest are likely to have an abortive result. The unconscious trends that operate in favor of street music seem to struggle for expression. Supervisors of public school music testify that the child who has had pure music artificially forced on him will on leaving school at once revert to the cheaper music that he has had to suppress. But the testimony of these same supervisors is unanimous that while children cannot be driven away from cheap music they can be lured away from it, if only their interest in good music is developed along natural lines. Nothing is deader than a last year's popular fox-trot, and nothing more vitally interesting than a favorite classic for one who enjoys good music.

Our problem was to make a quantitative comparison of certain effects of classical and jazz music after the first and twenty-fifth hearings. We made use of four phonograph selections. The two representing classical music were a record of Beethoven's Fifth Symphony, First Movement, and one of Tschaikowsky's Sixth Symphony, the "Pathétique," First Movement. The two selections representing popular or jazz music were a fox-trot, entitled "That's It—A Fox-Trot," and a one-step, entitled "Umbrellas to Mend." Each trial consisted of five hearings of each of the four records, and the complete experiment consisted of five trials, or twenty-five hearings. Thirty-five of the 54 subjects who began the experiment were able to be present at every trial.

The effect of the music was recorded in five ways:

1. A judgment of the enjoyment value of the piece, recorded as an estimate on a scale of ten points.

2. A record of the speed of tapping in a thirty second trial before and after the hearing of the music.

3. A record of strength of grip before and after the music.

4. A record of the pulse beat under ordinary conditions and during the music.

5. A photograph showing the facial expression while the music was being heard.

The initial familiarity of the two types of music was practically the same, as only 3 of the subjects remembered ever having heard either of the two classical pieces, and only 4 of them felt that there was anything familiar about either of the two jazz selections.

The accompanying table gives the complete data for each of the 35 subjects for the first and last effects of the four selections. The records are tabulated in the order that the pieces were always heard, namely, Beethoven, Tschaikowsky, fox-trot, one-step. The first four columns following the initials of the subject give his records after the first hearing. The last four columns give the corresponding records after the twenty-fifth hearing. Column 1 gives the enjoyment value of a piece after the first hearing; column 5 the enjoyment value after the last hearing. Column 2 gives the tapping record immediately after the first hearing; column 6 the corresponding record after the last hearing. Similarly, columns 3 and 7 give the first and last records of strength of grip; and columns 4 and 8 the first and last records of the pulse. The photographs following the tables give the first and last facial expressions of the subjects for both the classic and the jazz music.

If now we examine the averages of first records at the end of the table, we find that Beethoven with 5.88 and Tschaikowsky with 5.60 out of a possible ten points have an initial advantage in enjoyment value over the fox-trot with 5.00 and the one-step with 4.37. The two classical pieces are thus ranked about 22 per cent higher at the outset by this particular group of subjects. By the end of the twenty-fifth hearing this difference had risen to 38 per cent, as the Beethoven rating had risen to 6.09, and the Tschaikowsky rating to 6.94, while the jazz ranks had remained practically constant.

The initial tapping record after hearing Beethoven was 207.3, and after Tschaikowsky was 208.7, an average of 208 taps per thirty seconds. The average of the two popular pieces was 211 taps, three more than for the classical music. For the 51 subjects who began the experiment there was an initial difference of 6 taps in favor of the popular music. At the end of twenty-five hearings this difference had almost entirely disappeared.

TABLE 1

NAME	FIRST RECORDS				LAST RECORDS			
	Rank	Tapping	Grip	Pulse	Rank	Tapping	Grip	Pulse
W. A.	8	200	52		9	224	64	68
	6	205	60½		8	210	56	70
	1	219	59½		7	205	61	68
	5	217	58		5	212	60	70
E. B.	5	163	43	80	8	195	46	75
	6	178	40½	78	7	202	51	68
	8	178	42½	83	4	105	48	70
	4	163	44	82	4	202	46½	72
H. C.	5	234	52½	02	5	241	50	95
	4	244	47½	00	4	234	58	06
	5	226	50	91	7	220	58	100
	5	245	49½	85	6	230	58	07
R. L.	7	182		84	0	184	54	75
	1	187		81	7	185	54	76
	5	189		87	4	167	51	78
	5	191		84	5	175	50	78
J. L.	6		55	87		190	43	75
	7		42	88		200	44½	77
	0		44	92		206	44½	78
	0		47	00		213	43½	78
L. M.	5	191	50	91	6	194	52	06
	6	185	50	93	5	184	53	94
	6	199	51	95	7	200	51	96
	7	176	50½	97	7	196	50	93
C. T.	7	197	43½	71	8	190	45	81
	3	102	45½	76	9	182	47	79
	4	193	46	75	5	185	45	81
	4	183	41	77	7	188	40	80
E. T.	6	214	54	66	0	234	50½	78
	6	217	50	63	10	230	49½	76
	6	222	53½	60	0	212	47	82
	1	223	53½	67	0	217	48	80

TABLE 1—*Continued*

NAME	FIRST RECORDS				LAST RECORDS			
	Rank	Tapping	Grip	Pulse	Rank	Tapping	Grip	Pulse
N. A.	3	216	54	75	3	236	59½	63
	2	200	40½	76	4	240	60	60
	3	228	53	84	4	234	61½	60
	4	225	54	81	3	279	59	60
C. W.	6	187	53	77	3	186	53½	72
	5	200	58	70	8	188	62	66
	6	186	52½	77	9	182	56	69
	4	188	49	78	4	184	56½	67
J. W.	7	173	48½	74	8	167	61	76
	3	156	50	73	7	166	58	74
	0	162	57	76	3	165	59½	76
	2	161	56	74	0	168	60	78
R. S.	3	284	47	77	3	319	48	94
	7	207	46½	74	5	303	54	90
	3	264	48½	79	5	331	50½	96
	2	241	45½	79	4	313	55	90
R. W.	6	189	62	80	5	207	60½	62
	6	196	58½	78	6	206	60½	63
	6	198	57	81	5	211	56	64
	4	177	58	79	4	208	56	68
C. G.	6½	281	58	83	8½	271	57½	92
	8½	270	55	89	0½	205	60	85
	8	272	55	92	4	272	56	92
	9	275	54	84	3	272	56	98
W. G.	8	194	46	87	6½	204	50½	91
	7	198	48	85	6	207	56½	93
	5	202	43	89	3	204	61	96
	4	197	45	85	3	195	53	93
J. H.	4	228	51	72	4	224	40½	64
	5	232	47	69	5	238	52	64
	4	240	55	74	5	224	51	60
	6	250	53	74	4	236	50	68

TABLE 1—*Continued*

NAME	FIRST RECORDS				LAST RECORDS			
	Rank	Tapping	Grip	Pulse	Rank	Tapping	Grip	Pulse
J. A.	5	235			8	235	77½	51
	7	249			7	242	76½	48
	2	243			4	231	75	53
	3	237			3	251	75	54
A. C.	7	177	52	72	5	239	65	69
	8	180	66	71	5	244	62	65
	5	220	68	72	7	226	62	64
	5	211	70	76	6	233	62	64
W. D.	5	215	52	75	7	220	51½	62
	7	239	47	75	8	220	55	64
	3	227	59	76	4	199	55½	74
	2	226	55	82	4	219	55½	73
F. D.	5	177	52	67	7	181	50½	64
	4	178	57	71	5	178	57	64
	3	181	57	73	5	170	53	64
	3	180	57	70	4	172	56	64
J. G.	4	193	64½	68	4	194	63½	64
	6	192	68	76	6	193	60	64
	5	209	66½	81	3	197	67	62
	5	212	66	79	5	193	66	63
W. K.	4	185	63	68	7	178	67	60
	3	179	58	67	9	184	68½	61
	2	169	64	70	2	182	69	63
	2	177	68	68	1	176	68½	62
E. L.	6		58½	58	4	195	58½	62
	3		59	61	7	210	58	64
	1		58	61	4	210	62	64
	6		55	61	5	208	59	62
L. N.	8	217	54	71	7	252	57	89
	7	227	62	70	9	242	57	89
	5	227	57	68	6	239	56	92
	1	225	54	75	6	245	55½	92

TABLE 1—*Continued*

NAME	FIRST RECORDS				LAST RECORDS			
	Rank	Tapping	Grip	Pulse	Rank	Tapping	Grip	Pulse
H. N.	7	202	50	73	0	215	57	69
	5	207	52	76	8	202	56	70
	2	217	49	79	7	200	58	70
	3	207	55	78	7	206	53	78
R. W.	4		57	60	6	227	56	75
	5		58	60	7	225	55	74
	3		58½	61	5	212	49	88
	4		55	60	4	215	56½	88
D. C.	3	197	38	74	5	185	30½	67
	8	185	38	79	9	195	40	72
	7	202	40	80	4	199	27½	68
	4	174	38	75	4	189	35	73
M. D.	6		55	80	6	232	55	85
	0		58½	83	7	235	55½	80
	4		56	83	6	241	55½	86
	8		55½	84	5	247	56	83
P. N.	7	214	48	73	6	224	49	73
	8	208	48	66	10	201	49	76
	6	213	48	78	7	210	47	78
	3	211	51	60	3	221	49½	81
H. P.	6	223			0	253	55½	62
	7	238			8	241	54½	56
	5	246			4	250	57½	55
	4	263			3	241	55	55
D. S.	8	216	65½	87	6	225	73½	70
	8	207	70	81	9	231	75	77
	0	216	67	80	7	227	75½	77
	9	221	66	81	9	238	74½	76
C. S.	8	225	71	80	8	220	68	76
	7	246	78½	80	7	227	72	76
	7	240	78½	85	5	244	77	77
	6	228	80	84	6	230	75	77

TABLE I—*Concluded*

NAME	FIRST RECORDS				LAST RECORDS			
	Rank	Tapping	Grip	Pulse	Rank	Tapping	Grip	Pulse
H. H.	3	174	48	80	5	209	48½	83
	3	170	49½	81	4	208	50	83
	6	185	51	83	3	206	46½	81
	7	201	50	79	4	201	46½	82
O. S.	2		53	69	6	208	45	82
	5		51	73	7	193	43	79
	6		55	76	4	184	48	79
	4		51	74	8	184	46	80
J. W.	6	231	59	84	4		60	88
	3	222	56	82	4		58	86
	8	210	62	80	8		58½	85
	8	187	62½	87	7		59	88
Average	5.88	207.3	53.4	73.8	6.09	216.4	55.4	74.5
	5.60	208.7	54.0	73.9	6.94	212.3	56.5	73.6
	5.00	212.8	54.9	76.6	4.01	213.3	55.9	75.8
	4.37	209.1	54.5	75.7	4.50	216.6	54.0	76.1

The records of the strength of grip, indicated in the third and seventh columns tell very much the same story as the tapping test. At first there is a difference of 1 kgm. or about 2 per cent in favor of the effect of jazz on this type of muscular performance. The difference was as much as 3.3 per cent for the original 54 subjects. But the column 7 record shows that twenty-five repetitions had eliminated this initial difference, and had even left a slight advantage in favor of the classical selections. A test of steadiness given with a Bryan tracing board and an electric sounder resulted in initial scores of 7.6 and 7.0 for the original 54 subjects as they listened to the classical selections. The scores of these same subjects were better by 8 per cent when the jazz music was playing. As this test could be given only at the beginning of the experiment, no data appear under this head in the table, but it gave further evidence of a definite initial

FIG. 1

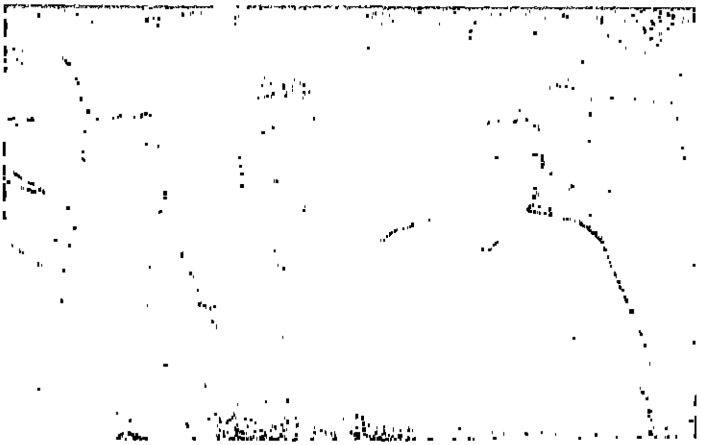

FIG. 2

FIGS. 1 AND 2. SHOWING FACIAL EXPRESSION OF SUBJECTS WHILE LISTENING TO UNFAMILIAR CLASSICAL MUSIC

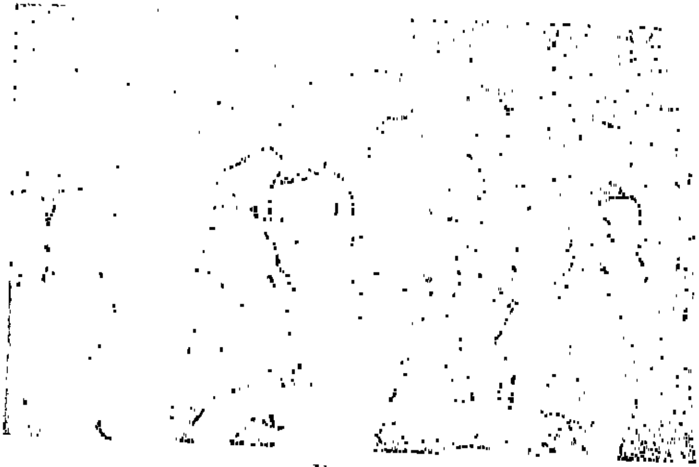

Fig. 3

Fig. 4

Figs. 3 and 4. Showing Facial Expression of Subjects While Listening to Unfamiliar "Jazz" Music

FIG. 5

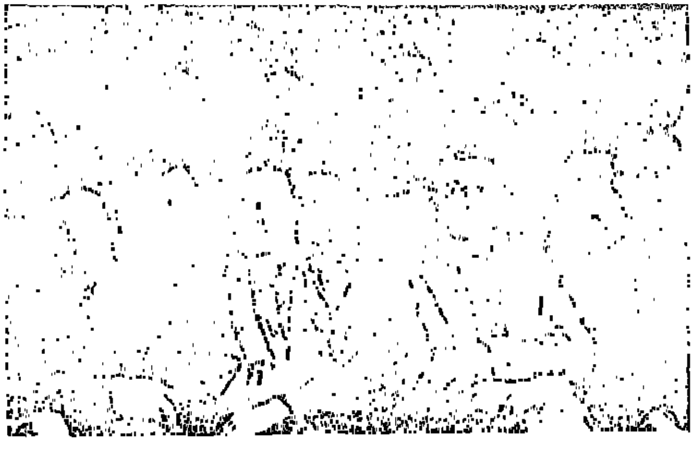

FIG. 6

FIGS. 5 AND 6. SHOWING FACIAL EXPRESSION OF SUBJECTS WHILE LISTENING TO VERY FAMILIAR CLASSICAL MUSIC

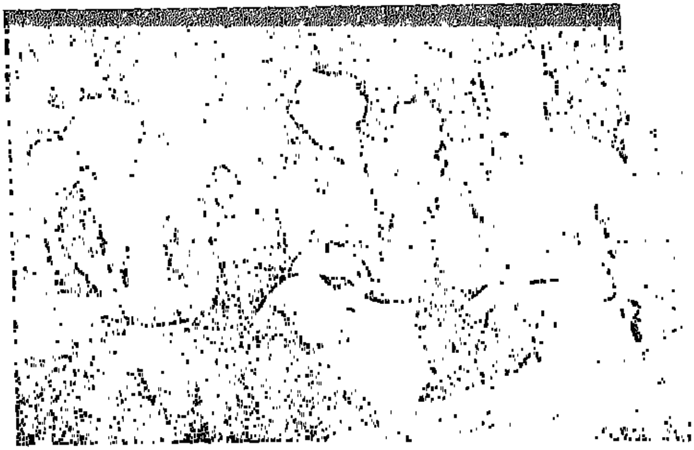

FIG. 7

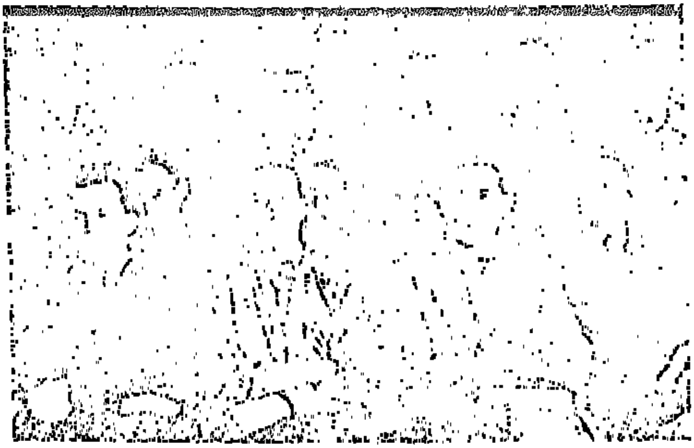

FIG. 8

FIGS. 7 AND 8. SHOWING FACIAL EXPRESSION OF SUBJECTS WHILE LISTENING TO VERY FAMILIAR "JAZZ" SELECTIONS advantage in motor innervation resulting from the hearing of jazz music. Presumably the effect of constant repetition would have been to greatly reduce this difference.

The records in columns 4 and 8 show that the first hearing of a jazz selection gives the pulse 2.5 more beats per minute than does the first hearing of a classical selection. And this difference, curiously enough, seems not to disappear with the repetition of the selection.

The last comparison was that of the effects of the two kinds of music on facial expression and bodily posture. Small groups of subjects were photographed while listening to each of the four selections, and were told to give their attention to the music unmindful as far as possible of the fact that they were being photographed. The first two photographs show pictures of two groups as they listened for the first time to the two classical selections. The next two show the same persons listening for the first time to the two jazz records. Exact quantitative comparison is impossible here, but a close inspection of the photographs reveals some interesting contrasts of attitude. In listening to the unfamiliar classical music there is distinctly more tendency to lower the head, to avert the gaze, and to assume a slightly puzzled, uncomprehending expression. There is also considerably less tendency toward smiling lines about the mouth. A comparison of the last two sets of photographs presents quite a different contrast. Again we have two identical groups of subjects, but photographed in this case while listening for the twenty-fifth time. Note the greater erectness of posture, the greater directness of gaze, and other subtler evidences of interest are definitely in favor of the classical records. So far as the photographic evidence goes it tends to show that familiarization with classical music produces an attitude favorable to the best type of morale, whereas familiarization with jazz makes for a listless attitude. Briefly, the question raised by the camera in regard to music is whether it is better to go from a condition of puzzled strain to one of alert attention or from one of comprehending levity to one of bored listlessness. The question is a pointed one as regards phonograph records, for repetition is the inevitable rule with everything pertaining to the phonograph.

CONCLUSIONS

The data here presented tend to show that an unselected group of college undergraduates inclines to prefer the best classical music to the average jazz selection. And this preference increases rapidly as the two types of selection are repeated again and again. Indeed the experiment was seriously endangered at one time by repeated threats of a few of the subjects that they would break the jazz records if they were to be required to listen to them many more times. It is not, however, so evident that the twenty-five hearings made the group as a whole love jazz less, but rather that it made them love Beethoven and Tschaikowsky more.

Jazz records evidence their peculiar fitness for dancing by the greater motor innervation which they occasion, and by the more rapid pulse count that accompanies them. They also inspire a becoming levity of countenance most favorable to certain types of social occasion. But repetition is decidedly more favorable to the classical selection, whether we approach the comparison from the standpoint of enjoyment, of motor innervation, or of facial expression.

Two educational conclusions seem to be implied by our results. The first is that since the strongly marked rhythm of street music has such an immediate stimulating value, it is important to select as our first music for the child or the musically immature pieces that have a strongly marked rhythm, as well as melodic, harmonic, or structural merit. It is the rhythm that will first get the child's spontaneous attention, and the other musical values will gradually unfold themselves to him as he hears the selection repeatedly. The second conclusion is that since good music apparently tends to develop interest when it is heard repeatedly with an unprejudiced mind, it is important not to inject any moral controversy into the matter of appreciating music. If a boy is faced with a piece of classical music that is slightly beyond his comprehension, and told that unless he enjoys it there is something wrong with him, he may easily set up defense mechanisms against all classical music. But though we may find that it does not pay to take a moralizing attitude in the teaching of good music, we should not lose sight of the ultimate fact suggested by our photographs, that the appreciation of good music does tend to make for improved morale. The great seriousness with which the Germans took their group music was the occasion of much amused comment during the early months of the war; but one can hardly question now that music was used to better psychological effect by them than by either the French or the British. And the rôle of music in in time of war has after all much in common with its rôle in time of peace. Seriousness of mind in crowds is a rare phenomenon without the aid of music, and it is becoming increasingly evident that serious crowd purposes are as insistently needed at present as they were even in August, 1914.

The superficial commercial argument from our data might perhaps be that it would be of more profit to the manufacturer of records to put his main emphasis on the type of selection for which the appeal will shortly decline, in the hope that new curiosity for other pieces may keep up the most continuous kind of demand. Against this stands the consideration that the purchaser who has grown fond of a classical selection will pay much more for the record that he so strongly desires; and the further consideration that the man who has found durable pleasures in the field of phonograph music is likely to be more curious about exploring the whole field further. The influence of fashion in musical tastes is undoubtedly a great factor in altering temporarily the enjoyment values of certain kinds of pieces, but inasmuch as all fashions are temporary, we may fairly assume that the progress of enjoyment as described in a laboratory experiment is characteristic of the long-run effects on music from decade to decade. We may infer then that the manufacturer who expects to develop a steady, regular trade, in which he will supply the highest grade of workmanship is more justified in selecting classical music for the reason that these records will continue to make their appeal, and hence will constantly tempt the purchaser to explore new possibilities in the field.

FURTHER STANDARDIZATION OF CONSTRUCTION TESTS A AND B

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The paucity of adequate norms for the Healy-Fernald Construction Tests A and B stimulated further research and standardization, resulting in this article. Fifteen hundred ninety-six records taken from the files of the Judge Baker Foundation form the basis of this study.

Construction Test A was described by its originators, Dr. William Healy and Dr. Grace M. Fernald as follows: "This test brings out preception of relationship of form and also the individual method of mental procedure for the given task—particularly his ability to profit by the experience of repeated trials in contradistinction to the peculiar repetition of impossibilities characteristic of the sub-normal and feeble-minded group."[1] The scoring recommended by Healy and Fernald involves four points: (1) time, (inability to solve test at end of five minutes being recorded as failure)[2], (2) number of moves made, (3) number of impossible moves, and (4) repetitions of such impossibilities. In their original article, Healy and Fernald added that "the ability to profit by the experiences of trial and success or failure is so important, that for its estimation it seemed distinctly worth while adding a somewhat harder task of the type of Test III (i.e., Construction Test A). When the performance has been remarkably good in Test III we have occasionally felt sure that it was partly due to chance and so wished to carry the investigation further on this point."[3] A more complex test was evolved, namely, Construction Test B. This is presented in the same manner as Construction A, and the time and the actual placings of each piece are recorded.

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[1] Healy, W., and Fernald, G. M., Tests of practical mental classification. Psychol. Monograph, vol. XIII, no. 2, Review Pub. Co., March 1911, p. 15.

[2] Originally the time limit was ten minutes. The present time limit five minutes is a modification based on the experience of the Directors of the Judge Baker Foundation.

As far as the writers know there have been up to date ten attempts at standardization of Construction Test A, and four of Construction Test B. The following paragraphs contain a short summary and critical analysis of each.

The study of Dr. Clara Schmitt in 1915 constitutes the first real attempt to standardize the tests.[4] She tested approximately 150 children in the first six grades of a private school. The results are expressed mainly in terms of the method the children used in solving this test, i.e., planned, trial and error, and chance which classification leaves much to the subjective judgment of the examiner. We feel that this study was invalidated by the utilization of a small, highly selected group, and the presentation of the results in a form so complicated and obscure as to offer no basis for comparison.

In the same year, Dr. Gertrude Hall standardized the tests from the performance of 180 children ranging in age from seven to twelve years.[5] She concludes that Construction A is a test for nine-year-olds, since no greater proficiency is attained at higher levels; and that Construction B is a test for eleven-year-olds for the same reason. It is noteworthy that she ignores the average time of successes and regards only the percentage of decrease in failure. Moreover, the testing of only 30 children at each level presents an insecure basis for generalizations.

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[3] Healy, W., and Fernald, G. M., op. cit., p. 16.

[4] Schmitt, C., Standardization of tests for defective children. Psychol. Monograph., vol. XIX, no. 3, Psychol. Review Co., Pennsylvania, July, 1915, pp. 93–100.

[5] Hall, G., Eleven mental tests standardized. Eugenics and social Welfare Bul., no. 5. State Board of Charities, New York, 1915, pp. 26–41.

We need not discuss in detail the study of Construction A by Bruckner and King,[6] since they regard it as a learning test, a use for which it is not intended, as is pointed out by Dr. Augusta F. Bronner in an article published a few months later.[7] She presents norms obtained from testing 437 children of "good innate ability" from eleven to seventeen years of age. We feel that Dr. Bronner's norms, like those of Dr. Schmitt, do not represent the normal performance of the average child. Both Dr. Bronner and Dr. Schmitt worked with groups too small to warrant reliable conclusions. Furthermore, they used groups too highly selected, Dr. Schmitt's from a social standpoint and Dr. Bronner's from the point of view of mentality. It is to be noted that by selecting only those of good innate ability, not only the feeble-minded, but also the dull normals are eliminated.

Pintner and Paterson,[8] on the other hand, have tipped the scale in the opposite direction. They profess to deal with an absolutely unselected group and in accordance with this principle, have included both the feeble-minded and the superior children. Of course, if there were an equal number of each, their contention would be sound. However, since their relatively small group of subjects is recruited entirely from the public schools, it is likely that the fifteen- and sixteen-year-olds, at least, are feeble-minded. Therefore at these ages the feeble-minded would certainly over-balance the superior group. Apart from the methods the results themselves do not seem to us to warrant their implicit conclusion that this is an age level test.

Both Kuhlman[9] and Terman[10] in their revisions of the Binet Simon Scale place Construction A at the ten-year level. It is impossible to evaluate their decision, since they submit none of the data from which they drew their conclusions. Moreover, they depart from the usual procedure in altering the time limit and using it as a learning test. On the other hand, Knox[11] places the test at the eight-year level, since 50 per cent of his eight-year-olds accomplished the task within five minutes.

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[6] Bruckner, L., and King, J., A study of the Fernald Form Board· Psychol. Clinic, vol. IX, no. 9, February, 1916, pp. 240–257.

[7] Bronner, A. F., "Construction Test A" of the Healy-Fernald Series. Psychol Clinic, vol. X, no. 2, April, 1916, pp. 4–44.

[8] Pintner, R., and Paterson, D.G., op. cit., pp. 44–53 and 122–126.

[9] Kuhlmann, F., A revision of the Binet-Simon system for measuring intelligence of children. Journal of Psycho-Asthenics, Monograph Supplements, vol. I, no. 1., September, 1912, pp. 33–44.

[10] Terman, L. M., The Measurement of Intelligence, Houghton Mifflin Co., Boston, 1916, pp. 278–280.

Another special study is that of Dr. J. Weidensall,[12] who standardized the tests for 88 adult delinquent women. In establishing norms based on the performance of adult subjects alone, she clearly intimates that she does not consider Construction Tests A and B age-level tests.

A recent contribution is the study of Dewey, Childs and Ruml.[13] They used for their subjects Jewish children from the New York City public schools. They counted only successes, used a time limit of eight minutes, for which they had no precedent, and eliminated the feeble-minded without considering the superior. They explicitly state that their norms can be used only in reference to racial groups and do not apply to the average American child.

The 1596 records used in this study have been gathered over a period of six years from children studied irrespective of age, race or nationality. While this group contains many cases referred for educational and vocational advice, it is true that the majority is recruited from the ranks of juvenile delinquents. However, we feel that they represent a diverse and heterogeneous group, and not the ordinary court offender. This is largely due to the fact that in Boston, children are apprehended for very slight offenses and that they come from all social strata. Desiring norms applicable to the children of the average community, we eliminated 162 superior and 158 definitely feeble-

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[11] Knox, H., A scale based on the work at Ellis Island, for estimating mental defect. Jour. of Amer. Med. Assoc., vol. LXII, March 7, 1914, pp. 741–747.

[12] Weidensall, J. W., The Mentality of the Criminal Woman, Warwick and York, Baltimore, 1916, pp. 214–221.

[13] Dewey, E., Childs, E., and Ruml, B., Methods and Results of Testing School Children, E. P. Dutton & Co., New York, 1920.

TABLE 1

Construction Test A—moves

MOVES	AGE								
	Nine years	Ten years	Eleven years	Twelve years	Thirteen years	Fourteen years	Fifteen years	Sixteen years	Seventeen years
5	6	20	27	29	43	74	103	80	48
10	6	11	12	17	17	36	31	37	16
15	7	8	10	20	13	19	27	23	4
20	4	6	5	13	15	21	15	11	4
25	4	7	14	10	4	18	10	15	1
30	2	3	5	5	6	9	6	7	1
35	2	2	6	5	5	4	3	4	1
40		4	5	2	2		1	2	
45		2	3	5	4	3	3	4	
50		1	2	1	1	2	1	1	1
55		1	3		1	1	1	1	
60			1	2	2	1	2		
65									
70									
75	1							1	
D.N.C.	12	26	8	12	5	7	11	3	1

Total..................	44	91	101	121	118	195	214	198	77
90 per centile...........	8	7	7	6	6	6	5	5	5
75 percentile............	13	11	9.5	10.5	7	7	7	6	6
Median.................	*21*	*25*	*22*	*18*	*14*	*12*	*10*	*11*	*8*
Boys................	23	20	22	20	9	11	10	12	8
Girls................	20	50	16	12		12	10	9.5	7
25 percentile............	D.N.C.	37	38	32	25	43	20	20	11
10 percentile............	D.N.C.	D.N.C.	59	D.N.C.	49	34	35	33	23
Quartile.................	*	13	14.2	10.7	9	18	6.5	7	2.5

D.N.C. = did not complete.
*Indeterminate.

TABLE 2

Construction Test A—time

TIME	AGE								
	Nine years	Ten years	Eleven years	Twelve years	Thirteen years	Fourteen years	Fifteen years	Sixteen years	Seventeen years
5	1	4	4	12	18	26	49	42	26
15	4	15	18	19	16	37	47	47	21
25	1	6	4	6	10	17	22	14	11
35	4	5	6	13	15	23	23	19	6
45	3	7	6	7	9	15	10	13	3
55	3	1	2	9	1	4	8	8	
65	1	3	6	4	5	9	7	7	1
75	4	3	7	5	9	5	7	9	2
85	1	2	2	3	5	7	10	8	1
95	2	5	2	5	3	9	4	3	
105			3	3	1	6	3	3	
115		1	3	2	4	6	5	3	2
125	1	1	3	10	2	4	1	3	
135	2	1	2	2			1	5	
145		1	2	2	1	3	1	3	
155	1	2	4		1	4		1	
165		1	1	2	1	1	1	1	
175		1		1	1	1	1	2	
185		1	3	1	3	1		5	
195	1	2	5	3	4	1	1	1	
220	1		1	3	1	2	1		
245		3	3		2	1	2	2	
270	1	2	5	4	1	3	2	1	
295	1		1		1	1	1		
D.N.C.	12	24	8	13	4	7	11	3	1

Total	44	90	101	129	118	193	218	198	77
90 percentile	20	17	16	14	12	12	10	9	9
75 percentile	46	31	30	24	22	120	50	15	12
Median	*92*	*94*	*81*	*63*	*44*	*40*	*29*	*32*	*18*
Boys	99	97.5	84	71	47	43	26	34	19
Girls	85	60.5	76	45	29	36	32	25	16
25 percentile	D.N.C.	180	188	131	99	102	71	73	33
10 percentile	D.N.C.	D.N.C.	290	D.N.C.	245	165	150	148	70
Quartile	*	74.5	79	53.5	38.5	9	10.5	29	10.5

D.N.C. = did not complete.
*Indeterminate.

TABLE 3

Construction Test B—moves

MOVES	AGE								
	Nine years	Ten years	Eleven years	Twelve years	Thirteen years	Fourteen years	Fifteen years	Sixteen years	Seventeen years
10	13	12	25	29	47	68	50	63	33
15	6	13	17	23	29	46	56	52	25
20	2	8	15	15	18	39	30	31	13
25	4	1	4	6	16	20	25	15	7
30	7	4	9	9	4	12	13	12	3
35	2			3	3	3	12	3	2
40		4	2	1		4	1	4	
45			3		3	3	2		1
50		1	1	2		2		1	
55									
60		1					1		
D.N.C.	24	30	28	37	35	38	35	27	12

Total	58	74	104	125	155	235	225	208	96
90 percentile	14	13	12	12	11	11	12	11	11
75 percentile	*15*	*18*	*15*	*15*	*14*	*14*	*15*	*13*	*13*
Median	*33*	*32*	*23*	*23*	*20*	*20*	*21*	*18*	*17*
Boys	30	27	23	23	20	21	21	18	16
Girls	35	D.N.C.	22	20	19	18	19	19	19
25 percentile	D.N.C.	D.N.C.	D.N.C.	D.N.C.	38	30	32	27	25
10 percentile	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.
Quartile	*	*	*	*	12	8	8.5	7	6

D.N.C. = did not complete.
*Indeterminate.

TABLE 4

Construction Test B—time

TIME	AGE								
	Nine years	Ten years	Eleven years	Twelve years	Thirteen years	Fourteen years	Fifteen years	Sixteen years	Seventeen years
15			1	1	1	2	2	8	3
25		3	6	5	11	19	10	8	9
35	1		4	2	17	18	14	27	13
45	2	3	4	12	8	11	19	15	6
55	3	7	7	6	10	13	18	11	10
65		1	3	7	9	16	12	16	3
75	2	3	2	5	10	16	16	12	5
85	4	3	8	1	7	16	5	11	2
95	1	1	7	5	4	7	10	5	6
105	2	3		2	5	13	7	8	4
115	1		5	7	7	6	6	6	3
125	1	1	5	5	3	8	10	6	3
135	1	2	3	2	4	5	2	5	1
145	2			3	3	3	5	5	3
155			3	1	3	3	2		2
165		3	2	2	2	6	7	2	2
175	1	3	3	2	2	3	5	6	1
185	1		2	2	1	5	6	2	1
195	1	3	2	3	5	6	12	8	1
220	5		2	4	2	5	7	7	
245	3	3	1	4	1	4	6	2	1
270	1	2	4	4	1	5	6	9	2
295	2	2	2	3	3	7	3	2	1
D.N.C.	23	30	28	37	36	38	35	27	12

Total	58	73	104	125	155	235	225	208	94
90 percentile	57	55	43	47	36	35	40	36	31
75 percentile	111	85	81	69	56	60	60	50	46
Median	*255*	*248*	*182*	*168*	*106*	*103*	*116*	*93*	*80*
Boys	264	195	135	185	106	102	127	91	60
Girls	251	D.N.C.	100	118	110	105	97	94	95
25 percentile	D.N.C.	D.N.C.	D.N.C.	D.N.C.	300	220	222	209	145
10 percentile	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.	D.N.C.
Quartile	*	*	*	*	122	83	81	99.5	49.5

D.N.C. = *did not complete.*
*Indeterminate.

minded. The decision in each case was based on the I.Q. obtained from the Stanford Revision of the Binet Simon scale, i.e., in accordance with the Terman classification, we eliminated as feeble-minded those with I.Q's below 70, as superior those with I.Q's 110 and above. In order to insure, further, a representative performance all failures were included. In all of the cases we present, the original instructions have been followed with the exception of the substitution of a five-minute time limit.

From the following tables it can be seen that the ages range from nine through seventeen. Only at the nine-year level are the numbers too small to be considered wholly reliable. Distributions are given in terms of both time and moves.

In opposition to some earlier investigators we are forced to conclude that neither Construction A nor Construction B, is an age level test. A mere glance at the tables confirms this point. In no case is the change in the median from age to age sufficient to justify the assumption that it is an age-level test.

In several instances, the difference in the time scores from year to year is not more than three or four seconds. While others have felt this sufficient to differentiate performances according to age, we believe it altogether too slight to warrant such a conclusion. For example, is it reasonable that 44 seconds should represent the median performance of a *thirteen*-year child and 40 seconds that of a *fourteen*-year old on Construction A? (see table 2). Of course, it is true that this same table shows a decrease of 18 seconds between the eleven-and twelve-year medians. However, in view of the former example, confirmed by many other instances, we feel that this change is an unreliable indication of year to year difference in ability. In noting the medians on Construction B (see tables 3 and 4), it is evident that here also the decrease in moves and seconds is neither uniform nor consistent. The results on this test are even more irregular. For instance, it may be noted that from eleven to seventeen the 75 percentiles for moves fall only *2* moves. The 90 and 10 percentiles were also obtained in the effort to ascertain whether in the upper and lower ranges the age performances were more significant. The differences were practically negligible. In the 90 percentiles on Constructon B there is an irregular increase and decrease in time from eleven through seventeen years. For moves there is a decrease of only 1. At all ages, the 10 percentiles failed to complete the test.

In view of these findings, we can only conclude that Construction A and B test special abilities. We can find no basis for setting forth norms for average performances from year to year. Somewhat contrary to subjective impressions, the girls do as well as the boys. There is, therefore, no basis for differentiation in terms of sex.

So far, we have dealt with the results only from a negative aspect. Positively, there is a definite, wide range within the limits of which the performance of the normal child must fall. It may be seen from the tables, that the median performance on Construction A is from *8* to *25* moves and *18* to *94* seconds. Again, the median performance on Construction B is from *17* to *33* moves, and *80* to *225* seconds. Performances below this are decidedly poor, and above this, decidedly good. Here, as in any other test, whether age-level or not, the older children should approximate the higher levels of attainment. Whereas the performances, as illustrated above, do not show a steady improvement from nine to seventeen years, still there is certainly an accretion of ability at the higher levels. This is clearly shown in our distribution tables. Thus we are able to gauge, more or less accurately, average performances.

It is interesting to note that Dr. Bronner at a much earlier date and on the basis of much smaller numbers, arrived at the conclusions which we now feel are entirely justified. In the words of her final paragraph:

> From the above, it would seem clear that "Construction—A" is not a good test for determining general intelligence or for placement at some specific age-level. Rather, it affords an opportunity of testing the subject's ability to solve a particular kind of problem, namely, one that involves perception of relationship of form. It enables one to know the subject's reactions in a particular kind of situation, to find the method

used in a solution, and the ability to profit by the experience of repeated trials. This it does as well for older as for younger subjects.[11]

Our own study seems to warrant the following conclusions:

1. Construction Tests A and B cannot be considered as age-level tests.

2. The test results cannot be differentiated on the basis of sex.

3. Construction Tests A and B are best considered as tests of special abilities.

4. There is a wide range within which it is safe to assume the performance of the average child should fall, the older children tending to approximate the higher level.

5. By comparison with this range, very superior and inferior performances can be readily detected.

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[11] Bronner, A. F., op cit., p. 44.

AN EXPERIMENT IN THE VALIDITY OF JUDGING HUMAN ABILITY

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INTRODUCTION

Despite the fact that it is all-important to evaluate other people, most of our every-day judgments are unconsciously arrived at. Nevertheless, a large number of experiments and many articles have demonstrated that the rating of character or aptitude, if it is to be of significance, must be done under controlled conditions.[1] That these conditions are not, at the present, available in our social and industrial institutions has led to the formulation of objective tests—a rating scale, and mental and trade tests—which when perfected may yield with some accuracy the desired information.[2] These two attempts are promising—especially the latter one.

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[1] Hollingworth, *Judging Human Character*, 1922; Starch, Reliability of grading work in mathematics, *School Review*, vol. 21, pp. 254–259; Rugg, Is the rating of human character practicable? *Journal of Educational Psychology*, November and December, 1921, February, 1922; Miner, Evaluation of a method of finely graduated estimate of abilities, *Journal of Applied Psychology*, June, 1917, pp. 123–133; Paterson, Methods of rating human qualities, in *Psychology in Business, The Annals of the American Academy of Political and Social Science*, November, 1923, pp. 81–93; Thorndike, A constant error in psychological rating, *Journal of Applied Psychology*, December, 1920, pp. 25–29; Kingsbury, Analyzing ratings and training raters, *Journal of Personnel Research*, December, 1922, January, 1923, pp. 377–383.

[2] See the following: Chapman, *Trade Tests;* Link, *Employment Psychology;* Kingsbury and Kornhauser, *Psychological Tests in Business;* Scott and Hayes, *Science in Working with Men*, Chapters 3 to 6; Scott and Clothier, *Personnel Management*, Chapters 14, 15, and 16; Watts, *An Introduction to the Psychological Problems of Industry*, Chapter 4.

Many psychologists believe that the current method of interview is unsatisfactory. To prove or disprove adequately such belief it would seem to be necessary to conduct such an experimental test as is described below under controlled conditions and to a reasonable degree of completion.

> Six district managers of one company were called together and instructed to select the best men from 36 individuals, to rank them in order of superiority. These managers' standards were identical, their industrial environment was the same. Each of them admitted he was a good judge of men. Yet the inconsistencies were striking.
>
> Excellent agreement was reached on applicant IV. But Applicant I, on the other hand, was ranked all the way from 1.5 to 11, Applicant V was ranked from 3 to 28, Applicant VI from 1 to 15, Applicant XIII from 3 to 23, and so forth. If any one of these managers judged these 36 applicants well, then 5 of them judged poorly. Yet all were "good judges of men."
>
> As a matter of fact, the skilled employment man probably is no better judge of men than the average foreman or department head. The difference between him and the foreman is that he recognizes his limitations in this respect. (In Scott & Clothier, *Personnel Management*, A. W. Shaw, 1923, p. 26. See p. 27 for table.)

The following experiment was undertaken to supply the necessary empirical data as to our ability to judge by personal interview, although it should be noted to begin with that it is only suggestive and not conclusive.

For this lack of conclusiveness there are these reasons: first, the number of subjects is too small and the probability of a chance agreement of judges too great; second, the experiment deals only with the attempt to judge by interview in a highly specialized field. In order to have a valid universal conclusion, a number of similar experiments—though the number need not be large—would have to be conducted in various representative fields of human endeavor. We must have "fair samples." Third the subjects used in this experiment were too heterogeneous and therefore it was easier for judgments to agree. Fourth, every scientific experiment must be verified more than once by independent workers before the conclusions may be accepted as true.

PURPOSE

As stated above, the object of this experiment was to determine the relative agreement between judgments derived from the interview and the history blank in judging character and aptitude by a number of "commercially competent" judges.

METHOD

The Packard Motor Car Company of Chicago requested Prof. D. T. Howard and myself to help them select four or more competent salesmen of motor trucks. A large-size "Want Ad" was placed in the Chicago newspapers, in response to which a great number of automobile salesmen replied. Out of this large group, the "obviously unsuitable" applicants on the basis of their letters were eliminated, while the remainder—twelve in all—were asked to fill out the usual familiar "employment form" of the Packard Motor Car Company and to appear at Northwestern University for special examination and interview.

The twelve applicants selected were a heterogeneous group: their ages ranged from twenty-nine to forty-six; their salaries varied from $3000 to $7000; their years of business experience extended from four to twenty-six years; their educations ranged from eight years in grammar school to three years in college; some were of American native stock, while others were of Norwegian, Swedish, and German extraction.

To this selected group the Scott Mental Alertness tests were given as well as a number of tests designed for the selection of salesmen by the Carnegie Institute of Technology. These were given, not because of their intrinsic value, but because of the opportunity that they offered for further study.

After the tests were taken the group was interviewed individually by seven judges. The judges were carefully selected to represent the "highest" caliber of sales managers in Chicago. Three judges (A, B and C) were sales managers of automobile truck departments, representing three different companies. One judge (D) was the president and general

TABLE 1

Rating of applicants by judges, their difference in ranking, consensus of judgments, and the ranking of applicants in special tests

APPLICANTS	JUDGES							TOTAL IN RANK	DIFFERENCE IN RANK	CONSENSUS	RANK IN TESTS
	A	B	C	D	E	F	G				
C. R.	1	8	4	1	2	2	4	22	6	1	11
C. Y.	7	1	7	2	5	5	1	28	7	2	4
B. W.	10	2	9	4	1	6	3	35	6	3	8
M. H.	2	9	8	9	3	4	2	41	4	4	5
L. R.	3	6	3	3	10	7	9	37	6	5	1
P. A.	4	7	1	10	8	8	5	43	1	6	6
B. L.	11	3	6	5	9	3	7	44	4	7	10
F. E.	5	5	11	6	4	11	6	48	1	8	2
M. M.	12	10	2	7	6	1	10	49	4	9	7
M. A.	6	4	10	8	7	10	8	53	12	10	9
S. T.	8	11	5	11	11	9	11	65	10	11	3
S. N.	9	12	12	12	12	12	12	81		12	12

TABLE 2

Average deviations of judges

APPLICANTS	JUDGES						
	A	B	C	D	E	F	G
C. R.	2.5	5.6	2.3	2.5	2.0	2.0	2.0
C. Y.	3.5	3.5	2.6	3.0	2.0	2.0	3.5
B. W.	5.6	4.1	5.0	3.0	4.6	3.5	3.3
M. H.	3.8	4.3	3.8	4.3	2.2	3.1	3.8
L. R.	3.3	2.8	3.3	3.3	4.8	3.0	4.0
P. A.	3.5	2.6	6.0	4.0	2.8	2.8	3.0
B. L.	5.5	4.3	2.6	2.8	3.1	3.8	3.1
F. E.	2.5	2.5	4.8	2.3	3.3	4.8	2.3
M. M.	5.8	4.0	6.1	4.0	3.6	7.0	5.6
M. A.	2.5	4.1	2.8	1.8	2.0	2.8	1.8
S. T.	2.5	2.1	4.8	2.0	2.1	2.0	1.8
S. N.	3.0	0.5	0.5	0.5	0.5	0.5	0.5
On all men	3.0	3.4	3.7	2.8	2.8	3.1	2.9

sales manager, while another (E) was vice-president and former general sales manager of two high-priced passenger-car automobile companies. The sixth judge (F) was the general sales manager of a national steel company. The last one (G) was a teacher of psychology.

TABLE 3

Correlation and average difference between judges

JUDGES	ρ	A.D.	JUDGES	ρ	A.D.	JUDGES	ρ	A.D
A–B	−0.82	4.5	B–D	+0.61	2.1	C–G	−0.97	4.1
A–C	+0.03	3.7	B–E	+0.44	2.8	D–E	+0.49	2.5
A–D	+0.16	3.8	B–F	+0.32	3.7	D–F	+0.47	3.0
A–E	−0.98	3.4	B–G	+0.57	2.2	D–G	+0.44	2.5
A–F	−0.94	4.1	C–D	+0.22	3.5	E–F	+0.59	2.3
A–G	+0.49	3.0	C–E	−0.05	4.4	E–G	+0.73	2.0
B–C	−0.82	4.7	C–F	+0.57	2.5	F–G	+0.28	3.1

TABLE 4

Correlation and average difference of each judge with the consensus of the other judges, and the average difference of each judge with every one of the other judges

JUDGES	ρ WITH THE OTHER SIX JUDGES	A.D. WITH THE OTHER SIX JUDGES	TOTAL A.D.
A.	+0.12	4.25	3.75
B.	+0.38	3.00	3.33
C.	+0.01	4.17	3.81
D.	+0.72	1.83	2.90
E.	+0.58	2.50	2.90
F.	+0.47	2.67	3.11
G.	+0.71	2.17	2.81
M. P.	+0.47		
D.		2.67	3.11

To each judge a private office was assigned which he was told to utilize as he pleased. He was advised to conduct the interview as if he were in his own office. Each judge was also instructed to make out a list of candidates arranged in what seemed to him their order of desirability with reference to their fitness to make good salesmen of the Packard motor truck in the Chicago territory.

The applicants were permitted to enter one at a time for a personal interview with each of the judges. In order to exclude the possibility of the ratings being influenced by the order of interviews, each applicant was assigned the order of his interview by a carefully worked out chronological system with respect to all of the judges. The range of time for individual interviews varied from five to twenty minutes.

CONCLUSIONS

1. There are the following three alternative explanations of the fair agreement between the rating of the judges as to who were the two best and two worst candidates: First, the applicants presented a very heterogeneous group as to education, selling experience, and age, even though all were of successful selling experience.[3] Second, this fair agreement may have been due to chance.[4] The third possibility is that the agreement

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[3] Of the two men selected for the first two places one had the best service record, which information was at that time available to the judges; he worked for one firm from 1001 to 1020 and for another since that time; the other man possessed an exceptional record of money earned on commission basis. Of the two men selected for the last two places, one was of considerably older age than the rest of the candidates—46; the other man's record showed that he had changed positions nine times between the years 1908 and 1922. This fair agreement of the judges might well therefore have been based upon the fact that the judges in common—not formally but unconsciously—agree upon qualities which may be merely superficial signs—age, past record, etc. —as of primary significance.

[4] That the agreement between the judges might have been largely due to chance is indicated by the large range of correlation (+0.01 to +0.72) between each judge and the consensus of the other six judges. While the correlation between the seven judges is even more representative of a typical chance "spread," it varies from (−0.98 to +0.73), tending, however, more towards plus correlations, the median being +0.32.

The probabilities are rather great for a chance agreement, especially when the group is so small and the possibility of variation so limited.

of the judges as regards the two best and two worst candidates is indicative of the ability of such judges really to distinguish the best and worst applicants.

2. While there was a fair agreement between the judges as to the best and worst applicants, there existed on the other hand, a great difference of opinion as to the remaining places, which, of course, is what one would expect to find. In fact the median difference of position as determined by the votes of the judges was 3.11. In other words, out of twelve possible places the reliability of the rank so assigned to any of the candidates varied over three places each way from the rank determined by the consensus of opinion, or half of the possible range. Therefore, even though the median correlation between each judge and the consensus of the other six judges was +0.47, this apparently high agreement is not a real indicator of the practical profit to be derived from the ranking of men by independent judges.

3. The correlation between the ranking in tests and the consensus of the votes of the judges was +0.12, a correlation the lowness of which is of interest. The dominating factor in these experimental tests was mental alertness, and in so far as mental alertness may manifest itself in neatness of dress and bearing, and thus become an important factor in influencing the judges, one would expect a larger agreement between measurable alertness and the opinion of the judges. The reason for this discrepancy was probably due to the fact that one applicant, who was older than the rest, was chosen for eleventh place by the judges because of his advanced age, whereas in the test he ranked third. If we should eliminate from the group this one applicant, then the correlation between the tests

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The probabilities are $\frac{1}{(12)^7}$ that all judges would agree upon the one who should be rated as the best man; while $\frac{1}{(12)^7}$ are the probabilities if any one man be designated for that place; $\frac{1}{(12!)^6}$ are the probabilities that the judges would agree with respect to every individual judged, and $\frac{1}{(12!)^7}$ that they would agree even if the ranks for the twelve applicants were arbitrarily designated beforehand.

and the consensus of the votes becomes +0.41. If we should take this higher correlation, then it appears from the correlation and the objective alertness tests that mental alertness as manifested in the dress and behavior of the applicant was a major determining factor in guiding the opinions of the judges. However, it should be noted that mental alertness may not in reality be a primary factor in sales ability.

4. One of the judges was not a business man. Nevertheless, his judgments show the same statistical characteristics as the judgments of all the other judges. One often hears that only sales managers *in their respective fields* are competent to judge. The experiment points, however, to the fact that the experience of the individual judge—business or otherwise—is of no significance. Any intelligent individual is just as good—or as poor—a judge by interview of potential sales ability as any other man.

CERTAIN ASPECTS OF THE SEX LIFE OF THE ADOLESCENT GIRL

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This investigation was made for the purpose of obtaining reliable information about the sex life of the adolescent girl. It seemed inexpedient and inadvisable to work out the investigation with the high school girl herself, because, due to her inexperience she is likely to fail in attempting introspection and also react unfavorably to the intimate questions which must be asked. It seemed impracticable to use the questionnaire with the married woman for in going over her reminiscences she is more likely, due to new interests and attitudes, to prepare her replies through memories which have become colored. The most reliable responses may be obtained from the college girl, since she has already made some, more or less definite, introspection of her many experiences and is not so far removed from her adolescent life as to color her recall.

The questionnaire used was not as complete as is desirable, but numerous difficulties prevented a more detailed form being employed. Among these are:

1. That girls are reluctant to answer questions dealing with personal experience.

2. That the working with questionnaires is a novelty to this group.

3. That they lack the experience necessary to see the value to future womanhood of such a study.

4. That there is a popular sentiment against such an undertaking; and various other minor difficulties.

In order to insure truth in the answers to the questions, a representative senior girl was selected from each house where girls lived. She gave a blank to each girl, instructing her not to place her name on it or the name of the house; to answer carefully and truthfully, or make no attempt to answer the questions; and then, to place the answered blank in an envelope, seal it, and return to the girl from whom it had been received. In this way the identity of the respondent would be concealed.

From about 300 blanks given out, returns were received from 177 girls. However, 6 of these had been filled by those who failed to understand the significance of the study. Consequently, these were discarded.

The questions submitted with a summary of the replies to each are as follows:

1. At what age were you first interested in "going out" with boys?
   a. The range was from ten years to eighteen years.
   b. The median age was fourteen years—20 per cent of the cases clustering at this point. The distribution was very scattered over the range of ten to eighteen years.
   c. Four had never been interested in boys.
2. At what age did your parents first give permission for you to "keep company"?
   a. The range was from twelve years to twenty-three years.
   b. The median age was sixteen years—35 per cent had permission at this age.
   c. Thirty-seven per cent were given permission before sixteen years.
   d. Eleven girls had never received permission.
3. Have you ever indulged in "spooning" or "petting"?
   a. Ninety-two per cent or 159 girls had indulged.
   b. Eight per cent had never indulged.
4. How old were you when you first "spooned"?
   a. The range was from twelve years to twenty-five years—however, only 1 case at each extreme.
   b. The median age was between the ages of sixteen and seventeen years.
   c. With the exception of 12 girls, no one had ever "petted" until after the parents' permission to "keep company" had been given.
5. What actuated you in "spooning"? (Some blanks had as many as three reasons checked, which gives a sum total of percentages much higher than 100.)

	per cent
a. Infatuation	52
b. Curiosity	40

c. Because "others did it"	30
d. Lack of courage to resist	12
e. Desire to please the man	12
f. Fear of being unpopular	11

g. Desire to repay for money spent on good time given
(There was only 1 girl who gave an affirmative answer)

6. Did the suggestion come from the movies? From modern literature?

Approximately 15 per cent gave affirmative answers to both of these questions, but these agencies seem to have had less influence than has been popularly supposed to be true. Other sources of suggestion named were "modern songs," "inspiration," "to pay a bet."

INFERENCES

In studying these results I do not believe they represent a group of abnormal girls, but rather they are the truthful answers to direct personal questions. Four cases seemed to indicate neurotic individuals. This is a small number in comparison with the whole group, approximately, one to every hundred girls.

STATISTICAL NOTE ON WORK IN EMOTION

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In reviewing the literature of the quantitative emotional work one frequently finds interesting work which is marred by very inadequate and even faulty statistical treatment of the data. This may cause invalid conclusions to be drawn from the data. The article discussed below is an example of this, and since it has been quoted several times it seemed advisable to show that a statistical analysis of the data does not uphold the conclusions drawn by the author.

Miss Mary D. Waller published in Lancet in 1918 an article entitled "The emotive response of a class of 73 students in medicine measured in correlation with the result of a written examination." These 73 students were ranked according to the results of a one hour test in physics. Galvanometric records were obtained from these students in response to the following stimuli: a sharp unexpected bang, threat to burn knuckles of the left hand, actual burn, threat of smell, voluntary inhaling of smelling salts, a series of questions, and a second unexpected bang.

From the data which she thus obtained Miss Waller concludes, "An analysis of the data brings out a correlation between the electrical quantities measured and the percentage number of examination marks." She bases her conclusions on the following data. By dividing the group into half according to their rank in the physics test she finds that the group of students who did best in physics also have on the average a larger galvanometric response. The differences are in most cases small and not significant. Due to the fact that Miss Waller graphs the average with a connecting line she gives an erroneous impression of these differences. To determine whether the differences were due to chance I found σ difference. Miss Waller has not used the mean for her "average." It is rather difficult to determine just what her averages are but they seem nearer the median. Since the mean would have been the best measure to use, because the P.E. of the mean is less than the P.E. of the median in data distributed as these data are, the mean is given in table 1 rather than Miss Waller's averages.

These differences are not significant, with the possible exception of the threats. This is shown by the last column which gives the number of times the second or less intelligent group would have a bigger emotive response if measured ten thousand times.

However, a better way to determine whether there is any relation between two factors quantitatively measured for the same group of individuals is to calculate the coefficient of correlation. In order to have the correlations positive, when there was relationship between marks and electrical responses, the ranks in the physics test which are from high to low in the paper were reversed and the correlations given in table 2 were found.

Since these correlations are consistently low we may conclude that the amount of the galvanometric deflection and the rank in the physics test are not correlated.

Since rank differences between individuals in the physics test are not equal, a still better treatment of the data would have been to have correlated the examination marks and the galvanometric response to avoid the fallacy of ranking; but since these were not available I used the ranks and the amounts of deflection with the Franzen crude score formula for correlation which is derived from the Pearson formula. It would also have been instructive to know the reliability of the examination marks.

By the same formula the inter-correlations in table 3 of the responses to the various stimuli were found to give an index of the reliability of the psycho-galvanic reflex.

That these correlations are only moderately high due to the fact that the stimuli are not identical is indicated by the fact

TABLE 1

	M_I	σ_{M_I}	M_{II}	$\sigma_{M_{II}}$	DIFFERENCE	σ DIFFERENCE	NUMBER OUT OF 10,000 NEGATIVE
Bang	12.17	1.61	10.27	1.35	1.90	2.10	1,829
Threat to burn	9.17	1.02	6.90	0.72	2.27	1.25	347
Burn	5.69	0.70	5.02	0.59	0.67	0.92	2,332
Threat of smell	5.83	0.66	4.26	0.69	1.55	0.95	514
Smell	7.25	0.83	6.86	1.28	0.39	1.53	3,995
Question	5.68	0.75	4.59	0.86	1.09	1.14	1,695
Second bang	10.65	1.06	10.15	1.06	0.50	1.50	3,694

TABLE 2

	r
Rank with first bang	0.176
Rank with threat to burn	0.127
Rank with burn	0.021
Rank with threat of smell	0.087
Rank with smell	0.004
Rank with question	0.007
Rank with second bang	0.024

TABLE 3

	r
Bang with threat to burn	0.500
Bang with burn	0.442
Bang with threat of smell	0.487
Bang with smell	0.399
Bang with question	0.421
Threat to burn with burn	0.474
Threat to burn with threat of smell	0.564
Threat to burn with smell	0.372
Threat to burn with question	0.394
Burn with threat of smell	0.572
Burn with smell	0.535
Burn with question	0.532
Threat of smell with smell	0.763
Threat of smell with question	0.698
Smell with question	0.719
First bang with second bang	0.811

that where identical stimuli were used (first bang with second bang) there is a higher correlation.

Miss Waller has expressed these reflexes in percentage of the original resistance. Since we do not know the absolute zero of the psycho-galvanic reflexes, which may be different for different individuals, percentages should not be used. W. W. Smith *in his article entitled "A note on the galvanic reflex"* offers a better method of correcting for individual differences in initial resistance of the skin.

Since inadequate and faulty treatment of data can mislead one in interpreting the results of experiments, a thorough statistical analysis of the results is essential in the study of quantitative emotional work as in other fields.

I am indebted to Dr. Raymond Franzen for helpful advice in the preparation of this article.

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NOTES ON THE THEORY OF SAMPLING AND APPLICATIONS IN ESTIMATES OF RELIABILITY AND CAUSAL INDEPENDENCE IN STATISTICAL SERIES

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SAMPLING

When a statistical result is based on observations of all the members of a class there is no question of its reliability. But if, instead of observing all, we take a part of the class, the question of reliability arises. Thus, out of many millions of a species we might observe 36 individuals in two organs or performances, obtaining a coefficient of correlation of 0.20. The series of measurements are primary statistical series. Now suppose that 100 such sets of observations were made, giving a series of correlation coefficients. This series would be an empirical secondary series, made up of results from the several primary series.

In practice the properties of such a secondary series are estimated from a single primary series. The graph of a secondary series is, at least approximately, a Gaussian frequency curve, and is called a curve of sampling. The standard deviation of the frequency curve of sampling, given by the appropriate formula in each kind of problem, is called the standard fluctuation of sampling of the statistical determination.

The "true" value of the statistical result for the whole class, supposedly ascertainable by observation, may be regarded as a force which draws the result of the single sample series towards itself. This force is approximately measured by the observed statistical result. The opposing, scattering tendency is the chance variability of the sample series. If several samples were actually observed their results would play around the true value, showing the effect of chance. The standard fluctuation of sampling of the statistical result is an approximate measure of this scattering tendency. Or, more accurately expressed, the ratio of these two values is a measure of the relative magnitude of the two "forces."

RELIABILITY

If a statistical result is represented by R, and its standard fluctuation of sampling by F, the relative strength of the centering and scattering tendencies is some function of the ratio R/F. For example, the standard fluctuation of sampling of the correlation coefficient mentioned in the first paragraph, obtained by Pearson's formula, is 0.16, and the ratio of the coefficient, 0.20, to its standard fluctuation of sampling is 1.25. Two ways of using this to estimate the reliability of the result obtained are the area method and the ordinate method. The area method considers the particular ratio as a point of division between two intervals, and compares the probability of the true value being in one interval with the probability of its being in the other. By the area method the answer in the above problem is that the odds are 3.8 that the true coefficient of correlation is between 0 and 0.20, to 1 that it is negative.[1]

In the ordinate method a comparison is made between the probability that the particular result is the true value and the probability that zero is the true value. The probability of zero being the true value is thus employed as a standard in all estimates of reliability by this method, and the particular value of the statistical result is used, apart from all ranges of value. In the above problem the ordinate method can be used to obtain an index of reliability of 0.08 for the observed coefficient of correlation. This index of reliability is computed as follows: If y is the ordinate, corresponding to an abscissa of the curve of sampling 1.25 times the standard fluctuation of sampling, it represents the probability that zero is the true value of the coefficient. Then if y_0 is the modal ordinate of the curve of sampling, it represents the probability that the observed value is the true one. Then the index of reliability is given by

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[1] Among many examples of the use of the area method see:

Thorndike, E. L., Theory of Mental and Social Measurements, p. 137.

Yule, G. U., Theory of Statistics, p. 311.

Davenport, C. B., Statistical Methods, p. 14.

Czuber, E., Wahrscheinlichkeitsrechnung, vol. I, p. 273 (p. 232 in the one volume edition).

$$I = 1 - 2\frac{y}{y_0}$$ [2]

This index of reliability varies from -1 for unreliable results, through 0 as a neutral point, to $+1$ for reliable results.

CAUSALITY[3]

It is often desirable to test the causal homogeneity or heterogeneity of two statistical series. Either the area or the ordinate method may be used, and the estimate of homogeneity or heterogeneity may be expressed in a variety of ways. For instance, an index may be made which will vary from minus one for perfect heterogeneity, or causal independence in at least one condition, to plus one for perfect causal homogeneity. If D is the difference between the statistical results of the two series, and F its standard fluctuation of sampling, there is a certain ordinate y of the curve of sampling of D, corresponding to the ratio D/F. Using the ratio of this ordinate to the modal ordinate of the curve of sampling, y_0, the index of homogeneity-heterogeneity is given by

$$H = 2\frac{y}{y_0} - 1$$

For other needs and conditions other indices may be devised.

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[2] A table of values of y/y_0 is given in Davenport, op. cit., p. 118.

[3] For a discussion of this problem from a different angle see Boring, E. J., On the computation of the probable correctness of Differences. Amer. Jour. Psychol., July, 1917, vol. XXVIII, pp. 454–459. I am greatly indebted to Professor Boring for his kindness in reading my manuscripts, and for his friendly and constructive criticism.

A TIP ON MANAGING PEOPLE

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"I entered this office as a clerk fifteen years ago. Today I am still a clerk. I feel sure my work is satisfactory because I am never called down. But if there is something wrong with me, I want to know what it is; because I want to get ahead."

How many times this plea for advancement is made in every large office!

In this particular case, the boss was quite sympathetic and willing to give the unfortunate man a chance. When asked to make a suggestion the clerk was ready.

"I should like to be made a Section Head responsible for getting ready the figures on which the weekly reports are based. I would need three clerks as assistants who would be under my authority."

But in assigning clerks to the new section trouble began. The ambitious clerk protested: "Oh, I could not use Miss B."

"Why? Is she not capable?"

"Yes, she is capable, but she is so stubborn. If I point out a mistake she has made, she always gets sore. And too, I would rather have someone else than Miss C. She does not think this recording amounts to much. She would rather do checking."

The chief's answer was, "The reason for your lack of advancement is quite clear to me now. The trouble is with you. If you ever hope to be an executive of any kind, you will have to learn the trick of stimulating other people *and getting them to* do willingly the work you assign."

Is this ability to manage people just a knack which some people have and others have not, or is it based on psychological principles which can be studied and learned? The vice president of a large corporation stated recently that this trait is rarer and more valuable than technical training.

The writer believes that executive ability will some day be fully analyzed. Present psychological work is preparing the way for the achievement of this goal. Human actions are now classified as expressions of fundamental tendencies. Tests make it possible to predict what applicants will be able to accomplish. The next step will give us principles of motivating people. How may we get them to do willingly what we would like to have done? This question can be partially answered by studying the applications of a not unknown principle. It is this:

HUMAN NATURE CRAVES RECOGNITION

All of us want recognition. Usually, however, prominence in one or two lines suffices us. Babe Ruth loses no sleep if others beat him at golf. Thomas Edison is not particularly disturbed if John Jones can excel him in book-keeping. There are, of course, gluttons for fame, just as there are gluttons for other things. But as a rule people are satisfied if they are recognized in relatively few lines of endeavor. Whiting Williams reports that even a laborer tries to "break through" in some way. If there is no chance of getting ahead in his work, he may become notorious as a "cusser." Another may gain the reputation of being a "devil with the women." In more polite circles the man who fails to achieve in business may be very active and prominent in church work, but all of us wish to amount to something along some line.

Illustrations of this craving for recognition appear at every turn. It is well known, but nevertheless amazing, that salesmen of mature years with large incomes assured, struggle with their fellows for positions of honor. Strange as it may seem, the same type of recognition which works in the kindergarten works also with grown men.

The weakness of many executives is their inability to subordinate self and give "the boys" the glory. The executive who will pat his men on the back and brag about them to other people may be lazy and unsystematic, but men will work for *him gladly*.

If you stop a man on the street and ask him for a stamp or a match even, he may show a trace of irritation, but if you ask him for information which he feels competent to give, he will expand with pleasure in telling it.

How can one make use of the craving for recognition in the problems of every day business? Let us suppose an unusually trying situation. A newcomer has been made head of a department in which the former head has been demoted but remains in the department. Nine times out of ten such a situation would mean war. But the newcomer instead of over-riding his predecessor goes to him for advice with an appeal somewhat as follows: "There is a great deal here which I do not know, and I shall have to come to you frequently for your opinion. I hope that you will not hesitate to make suggestions freely and as far as this section of the department is concerned I should like to have you take charge, reporting to me only at regular intervals."

The bitterest enemy is likely to succumb to such tactics. He not infrequently becomes an ardent supporter.

If a new idea is to be inaugurated it ofttimes pays to go to the opposition and ask for advice, explaining the difficulties of the present situation. If the gentleman who is likely to be opposed can be induced to make several suggestions, it may happen that one of them bears a faint resemblance to the idea proposed. In that case the tactful promoter immediately seizes upon this suggestion and exclaims, "There is an idea. I will study that over and see what I can make of it." Later he brings forth his original proposal giving the gentleman of the opposition credit for originating the idea.

It is common knowledge that all of us, even young babies, resist force exerted upon us. Forced movements tend to belittle us. Many a clever salesman has addressed his remarks to a third party whom he has no intention of selling, while Number Two, the real prospect, "listens in." When thus off his guard he accepts much more readily the idea presented and he buys.

A man who is very successful in getting endorsement of new ideas in committee sessions describes his method as follows: "I never come out strongly in opposition to a proposal immediately after it is presented. To do so is merely to draw the lines of battle and forget diplomacy. Instead I make every effort to forestall immediate action by asking for information, suggesting that the matter be looked into more thoroughly or possibly referred to a committee for subsequent report." At a later session the authorship of the proposal is less distinct in the minds of the committee and the plan may be attacked with relative impunity. At least to do so, is no longer so obvious a reflection on the author's judgment or a personal insult. It has been often said that almost any man can be persuaded to any fair course of action provided he can "save his face."

On the positive side one should never fail to pay a well merited compliment. False praise belittles the flatterer and justly so, but the proper recognition of real merit is refreshing to all. Any intended favor should be accepted wholeheartedly regardless of its intrinsic worth. The tactless man is thinking only of himself when he says, "Thank you very much for the flowers, but I cannot use them. My secretary always provides such things in my office." He should have been thinking of the kindly motive which prompted the gift and accepted the flowers with an appreciative spirit.

On the negative side nothing is more humiliating than indifference from a person who counts. If you enter a room which is occupied by but one other party, attend to the business which brought you there and depart without having noticed him in any way, your indifference has "cut" worse than any harsh word. On the other hand, undisguised disdain is a recognition of a negative sort which is frequently far less humiliating than complete indifference. Westerners are wont to compare their accomplishments and their cities with those of the East. Easterners never make such comparisons. The Easterner's indifference to the West irritates the Son of the Pioneer and he talks voluminously in self-defense.

The young man who is starting in business in a new environment can study with profit the workings of this craving for recognition. It is essential that he assume a modesty if he has it not, that he be duly impressed with the importance of the present staff and the merit of methods now in use, and that he wait at least a month before suggesting improvements.

The man who is always careful to give to others every recognition which is their due, need have no fear for himself. Recognition will eventually come back to him many fold.

A NOTE ON THE LEGIBILITY OF ITEMS IN A BIBLIOGRAPHY

CARROLL C. PRATT

Harvard University

In preparing a bibliography of scientific articles, arranged according to year of publication, for use in one of the Harvard museums, it was found necessary to place a suffix (a letter or number) after the date in order to distinguish more readily between articles written in the same year by the same author. The question then arose as to the optimal position of the suffix for quick legibility. Should the suffix be a letter or a number? And should the suffix be placed on the line or above the line; separated from the date by a space or placed next to the date? Rather than rely on *a priori* assumptions the compiler decided to have the matter tried out experimentally. The conditions of the test were not ideal, but it may be worth while to make a brief note of the results.

The following five samples illustrate the positions of suffix which were used in the experiment.

1	2	3	4	5
1904a	1904 a	1904^{a}	$1904\ ^{a}$	1904.1

Portions of titles of scientific articles were printed after the dates in order to make the conditions more nearly comparable to those actually met with in looking for a particular reference in a bibliography. Different dates and suffix-numbers and letters were prepared, and arranged in columns for presentation. The material was presented tachistoscopically, and before every exposure *O* was asked to find a particular date and suffix as quickly as possible. The time between the presentation of the material and the reaction of *O* was measured by a stop-watch which read to fifths of a second. Sixteen students (group A) in an introductory class in experimental psychology acted as observers. Later on 6 students (group B) from another laboratory class were given the same tests. The items under the five different arrangements of suffix were presented six times (without repetitions of identical items) to each *O*, making thus 660 trials in all.

TABLE 1

The numerical data here tabulated represent the average finding-times in seconds, with their mean variations, of two groups of subjects for each of five arrangements of suffix

		1	2	3	4	5
Group A	*Average finding-time.*	*1.745*	*1.754*	*1.975*	*1.545*	*1.900*
	Mean variation......	0.55	0.41	0.44	0.39	0.56
Group B	Average finding-time.	1.90	2.216	1.977	1.461	1.716
	Mean variation......	0.36	0.56	0.60	0.21	0.40
General average.............		1.822	1.985	1.976	1.503	1.812

The numerical results of the experiments are shown in table 1. The numbers represent the average times in seconds required for finding a given date and suffix by each of the two groups of subjects for each of the five arrangements of the items. The figures in the lowest line are the averages for all of the subjects.

An examination of the average finding-times reveals the fact that, with one significant exception, there are no striking differences in quickness of legibility between the different arrangements. This exception applies to no. 4 in which the suffix is above the line and separated from the date by a space. For both groups no. 4 has the shortest reaction-time, and also the smallest mean variation. From the figures for the general average it can be seen that by placing the suffix as in no. 4 the legibility is increased by about 17 per cent over the next best arrangement (no. 5) and by nearly 25 per cent over the poorest arrangement (no. 2). After no. 4 the order of reaction-times varies for the two groups of subjects. Although a correlation of about 0.5 obtains between the results of the two groups, the differences between nos. 1, 2, 3 and 5 are too small to permit of generalizations regarding relative speeds of legibility for these arrangements. But one may conclude with a fairly high degree of certainty from these results that the best position for a suffix to dates in bibliographical references is one in which the letter-suffix is above the line and separated from the date by a space. This conclusion is in line with certain of the results which Baird obtained in his investigations of legibility.[1]

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[1] J. W. Baird, The legibility of a telephone directory. Jour. of Applied Psychol., 1917, 1, 30–37. *Cf.* also B. E. Roethlein. The relative legibility of different faces of printing types. Amer. Jour. Psycol., 1912, 23, 1–36.

BOOK REVIEWS

CHARLES H. GRIFFITS. *Fundamentals of Vocational Psychology.* New York, The Macmillan Company, 1924. Pp. 372.

An elementary text-book which is to introduce the student to vocational problems is here presented. It aims to cover the whole field of vocational psychology not only from the standpoint of the employer but also from those of the employee and of society. The last of the three is, however, very lightly touched. The book is for the most part well-written and it furnishes a teachable introduction to its field.

Its great fault is an emphasis upon psychology at the expense of vocations. Should not a vocational psychology assume at least an elementary acquaintance with general and laboratory psychology? It would seem so. One wonders whether this volume is intended for the novice and the practical man who has no time to study the "fundamentals" of his science. If so, the text may do more harm than good to scientific vocational selection, guidance and education.

Why should a text upon vocational psychology begin with the germ-plasm and the problems of heredity? This text's treatment of the biological causes of human variability is unintelligible to those who have not had a course on heredity and useless to those who have. For neither group does biological variation constitute a "fundamental" of vocational psychology. Strange is the treatment of statistics. After a very slight presentation of the statistics of variability, the usual correlation formulae with examples are given. And after that, correlation is not used nor mentioned, one single instance excepted (pp. 280–90).

Entirely too much space is given to the description of elementary laboratory equipment and ordinary tests which may have a vocational use though this is, for the most part, left to the reader's inference. The same idea is followed throughout even to the showing of some pages of Army Tests and other material available everywhere. All this can be seen in any laboratory. And the whole treatment is academic, not industrial or vocational.

About a hundred pages are devoted to the interview, to trade tests and to a final chapter on "Choosing a Vocation." These are the best and most pertinent portions of the book. It also needs to be said that the volume is modest and written in excellent temper.

Equal praise can not be given to its technical finish. Closer proof-reading would have helped on pages, 81, 127, 130; the last sentence on page 121 will not be construed; and on page 157, data is. Franklin has enough to answer for without making him responsible (p. 11) for Bacon's "Reading maketh a full man, etc." Only a Whittier can afford to leave ragged rhymes for the carping critics.

William S. Walsh, M.D. *The Mastery of Fear.* New York, E.P. Dutton & Company, 1924. Pp. 315. $2.00.

The doctor looks at our fears and finds that most of them are either baseless or insignificant. In easy popular style he lists and describes a great variety of them: the fears of death, of ill-health, of old-age; the fears induced by superstitions and by true and false theories of heredity; the fear of public opinion, though he does not say, as perhaps he ought, that this is the special vice of the politicians in presidential years; the fear of various natural phenomena, water, lightning, the dark, open or closed places and so on.

If our fear is baseless the perception of that fact will help us to remove it and the book makes that suggestion. If, though based upon true perceptions, the fear does not help us to overcome or avoid the evil that we fear, then we are unwise if we do not try to conquer our fear; and the book points that out. If our fear is the result of mental or physical ill-health then hygiene and medical treatment are indicated. Here again the doctor is of service. He can show how physical and mental habits and attitudes can be molded so as to improve health and banish fear. And he does. But the story of the fears is far longer than that of the means of mastery.

The book is a popular discussion of a scientific and not-too-well-understood subject and it has the defects of its type. In the reviewer it has inspired a new fear without curing many old ones. The new fear is this, that the readers may not read carefully and ponder well the pages (3 to 10) which show that fear is normal and biologically useful, and not pathological except where it is inspired by unreal or harmless objects or when it becomes violent, persistent or otherwise uncontrollable by reason. But hope casts out fear; and the reviewer will try to hope that his caution will sufficiently underline the qualifying pages for the fearless reader.

H. G. Good,
Ohio University.

Katharine B. Graves. *The Influence of Specialized Training on Tests of General Intelligence.* Teachers College, Columbia University, Contributions to Education, No. 143.

This book presents the method, material, results and conclusions of an experiment intended to help answer the following three questions:

"How much effect on a child's score can we expect from school work similar to the tests? How far can a child be coached by persons of more mature intelligence? And, in either case, how long will these effects endure?"

After a preliminary investigation had been conducted on a small group of children, two schools were selected with great care as to their appropriateness for this particular experiment. Only second grade children were used as subjects. Each school had three classes of second grade children. In each school the children of one room were designated the "control group," of a second, the "similar group" and of the third the "coached group." The first step in each school was to test all the children with the Stanford Revision of the Binet. The next two weeks were devoted to the training of the children in the groups known as "similar" and "coached." The "similar" group were given training in test material thought to be similar to, but not identical with, the tests in years VI to X inclusive in the Stanford Revision of the Binet Tests; while the "coached" group were given practice on all the tests themselves from years VI to X inclusive.

Retesting of the children was started on the Monday following the two weeks training period. At school A the children were retested a second time at the end of thirteen weeks, and a third time at the end of fifty-five weeks. At school Y only two retests were given with a period of eighteen weeks elapsing between the first and second retests.

The results from this procedure furnish the basis for the drawing of 14 conclusions, from which the following may be quoted:

"1. Direct coaching on the material of the tests is extremely effective, even when the time given to the coaching is small.

"2. The effect of such direct coaching persists to a large degree for a period of three or four months, at least.

"5. Indirect coaching, or training in work similar to the material of the tests, is also effective, though to a much smaller degree. This effect is serious enough to be considered.

"6. The effect of such indirect coaching persists to a large degree for a period of three or four months, at least.

"11. The control group gains considerably from the repetition of the test. Continued testing gives a child an undue advantage over a child who has never had the test before."

Appendix I contains a complete table of results, Appendix II gives the material and method for training the "similar" group, and Appendix III gives the material and method for training the "coached" group.

The entire experiment is written up in good form. The materials and methods employed and results obtained are reported with such detail and completeness that it could readily be duplicated by others. It is to be hoped that various other experiments of similar nature will be undertaken to help guide us correctly in the use and interpretation of tests.

FREDERICK WARD NINDE. *The Application of the Auditory Memory Span Test to Two Thousand Institutional Epileptics: A Study in Relative Associability.* Thesis, University of Pennsylvania.

The title of this monograph tells exactly the nature and extent of the investigation. It presents the method and results of a clear cut problem. Many other problems are suggested to the reader by the results which come from this clearly defined and restricted problem. He uses Humpstone's method and then compares his results with the data collected by Humpstone on normal children and adults.

The two thousand epileptics tested cover all ages of both sexes from five to fifty, with twenty-five or more cases in forty-one out of the fifty-five age groups. The statistical evidence presented warrants the following general conclusions:

"1. The epileptic, both the child and the adult has a Memory Span only approximately one-half that of the normal individual.

"2. The epileptic adult shows a relatively far higher degree of associability than the epileptic child, and he is, therefore, far more capable of mental endeavor."

The second conclusion being wholly contrary to the generally accepted contention that epilepsy causes mental stupidity and degeneration is discussed briefly by the author. He is inclined to the opinion that, "there is but one adequate explanation, viz; the two conditions (epilepsy and mental enfeeblement) are the result of either:

"1. Distinct etiological factors acting in unison or independently of each other.

2. A common factor."

Three Problem Children. Joint Committee on Methods of Preventing Delinquency, Publication No. 2. 50 East 42nd Street, New York.

This little book reports in considerable detail the work, worries and progress encountered in an effort to study scientifically and to direct the lives of three children who had become greater and more serious problems year by year as they grew older. Each of these reports, written in narrative form has been taken directly from the case records of the Bureau of Children's Guidance conducted by the New York School of Social Work in its administration of one division of the Commonwealth Fund Program for the Prevention of Delinquency.

The guiding principle of the organization and work of the Bureau of Children's Guidance as expressed in the introduction is that "The modern understanding of behavior means that the day is dawning when the factors that lie behind conduct will be studied as intelligently as the physical causes which lie behind the baby's cry." The detailed record of the Bureau's work on three children fictitiously named Mildred, Sidney, and Kenneth, shows that safe and sane counsel on how to treat children who present behavior problems cannot be given without an extensive systematic investigation into the entire previous life, physical, mental, social and educational, and into the present physical and mental life of the individual. Because all three children are clearly not feeble-minded the fact is emphasized that all children who present behavior problems and not only the sub-normal need special study and guidance. While Mildred is probably an extreme case, the Bureau's work and accomplishments with her illustrate types of situations and conditions which may produce many school and life failures which could be prevented if those into whose care they fall took less for granted and went to the trouble of conducting or securing a scientific study of each case. Mildred was referred to the Bureau at age twelve. In school she was in the second grade with children hardly more than half her height or age. "The child had developed a profound state of intimidation, embitterment, and withdrawal from contact with others. Things had reached a pass where even her tutor, to whom she had at first responded well, could not, on certain days, elicit a word, a smile, or a gleam of interest in her work."

"Over against this picture we may set that of Mildred as she appeared one year later.

"She is alert, interested and keen; seems quite happy and free. She talks spontaneously of her school progress, her work with the Scouts, her home affairs. She is elated at having reached grade 5A, is tutoring once a week, and eagerly looks forward to advancement to 5B before the term is over."

Just what things the Bureau did to help bring about these marvelous changes and just what happened in Mildred's life before the Bureau took up her case are set forth in an interesting, running narrative covering thirty-five pages.

The book is written in such a direct and clear manner without technical terms that every person attempting to guide the lives of children can read it with interest and profit, be he school teacher, social worker, physician, attorney, parent, probation officer, attendance officer, judge, or officer of a child caring agency.

H. H. YOUNG,
Indiana University.

EDWARD S. COWDRICK. *Manpower in Industry.* Henry Holt & Co., New York, 1924. Pp. x, 388. $3.25.

A very complete survey of the human element in industry is attempted in this book, and accomplished thoroughly. The author traces this human element from labor supplies to theories of payment, from organized labor to selling employes houses. If he is partisan in industrial controversies he does not betray it in the impartial way he follows the ramifications of brains and brawn in modern industrialism.

The psychologist's only regret is that Mr. Cowdrick does not know psychology as well as he knows industry. As it is he has given psychologists an excellent skeleton on which to drape some of their knowledge so it will fit into present industrial organizations. At the same time this survey is very provocative; psychology has too little to hide the nakedness of the skeleton. But the psychologist should not put this book in the closet with his other skeletons; it should be read and work undertaken to relieve the rattling challenge.

FRANK A. NAGLEY. *Brains in Business.* A. C. McClurg & Co., Chicago, 1924. Pp. 317. $2.00.

Mr. Nagley, who has employed over 100,000 workers and who is now with the School of Business Administration of the University of Oregon, does not draw immediately out of his practical experience for this book. He has collected and given an interesting turn to around 300 bona fide successful business portraits to show forcefully how wealth is hidden in waste, how hindrances have been turned into helps, how new uses have been found for old products.

Of course this is not exactly brains in business. Psychologists would rather call it—according to the present vogue—visceral tensions in business, tensions of the sort produced by reading the *American Magazine.* This book will serve business and its readers well when its perusal provokes more energetic brain work. The book will do it: over 300 case histories, each with all the interest of the *American* type, each simmered down to a paragraph or two, each with a provocative point, are too much to be resisted by the usual reader.

Mr. Nagley does not dub this psychology; he does not emphasize buncombe. His book belongs fairly on the shelves reserved for the psychology of motivation. True enough it is inspirational in undercurrent, but while his eyes at times may reach to the clouds he keeps his feet as firmly on *terra firma* as any writer on motivation can.

Advertising and Selling. Edited by NOBLE T. PRAIGG. Doubleday, Page & Co., 483 pages. Cloth binding, $2.00.

This optimistic book is a compilation of the leading reports and addresses of the Atlantic City Convention of the Associated Advertising Clubs of the World. The contents resemble a Methodist experience meeting: they tell "how" it was done, the general tone is one of praise, but many a word of caution is given. For students of psychology the principal value of this book is the first-hand experiences reported; these suggest many practical problems capable of experimental solution by psychologists. For the teacher of classes in advertising who is naïvely innocent of practical advertising experience this book will supply much realistic thunder for his course.

This is fascinating reading, partly because of the kaleidoscopic presentation of topics, but perhaps more because advertising executives seem to be able to talk as well as they advertise.

LLOYD D. HERROLD. *Advertising for the Retailer.* D. Appleton & Co. 677 pages. Cloth binding, $5.00.

This is an elaboration of an extension course of the University of Wisconsin. It seems to have been prepared primarily to help the home-town merchant move his wares. The general field is touched upon, but most emphasis is given to newspaper advertising. The contents range from the mechanics of printing to follow-up letters, from what to advertise to window trimming. All the treatment is interesting and practical.

The text is not devoid of a psychological tang, but the contents are not well spiced with it. The book will serve the instructor well who is teaching the psychology of advertising to students who will not enter the national field. As a source of illustrations nearer home than a New York advertising office it is also of value.

G. B. HOTCHKISS AND R. B. FRANKEN. *The Leadership of Advertised Brands.* Doubleday, Page & Co. 256 pages. Cloth binding, $2.00.

This is an easily comprehended report of experiments conducted by the department of advertising and marketing of the New York University. With the coöperation of 21 psychologists in different parts of the country association experiments were conducted to determine the brand familiarity of 100 commodities. Eastman Kodak was found to lead.

The meat of the book consists of reports from the advertising departments of the leading brands, describing the policies and procedures followed in reaching a position of dominance. There are 125 pages of tables of the results of the association experiments.

Unfortunately it is not possible to reach any conclusion regarding factors that make for brand dominance except that several widely divergent policies have brought success.

HERBERT A. TOOPS, PH.D. *Tests for Vocational Guidance of Children Thirteen to Sixteen.* Columbia University, New York. 158 pages. Cloth binding, $1.60.

This is a report of investigations financed by a grant from the Commonwealth Fund to provide tests to predict the probable success of young persons in different careers. Tests that can be given to a group of 100 in three hours, with an expenditure of $30 for materials, ten hours of trained work, and 80 hours of clerical work have been used to disclose ability with ideas (general intelligence), ability with things (mechanical intelligence), and ability with clerical items and procedures.

Prevocational courses in the public schools were not found useful for guidance, although they do give one about to enter industry some facts and an interest in a trade. Improvement in mechanical ability appeared to be dependent more upon age than is improvement in general intelligence. Mechanical ability as studied was distinct from ability with ideas and clerical procedures. Special mechanical tests were devised for the girls.

Additional space is devoted to questions of organization and instructions for using the tests tried out. The only weakness of the present report is that there are *not yet* data on the correspondence of the test results with vocational success. These will be forthcoming, we are promised, in due time from 2000 young people now under observation in industry.

The report is scientifically meticulous; it is hard reading but well worth the effort for one who wishes to understand the methods and results of vocational placement and guidance through testing.

DONALD A. LAIRD,
Colgate University.

NEW BOOKS AND PAMPHLETS RECEIVED[1]

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

Advertising and Selling. Edited by Noble T. Praigg, Doubleday, Page & Co. Price $2.00. 483 pp.

Advertising of the Retailer. Lloyd D. Herrold. D. Appleton Co. Price $5.00. 677 pp.

Archivio Generale Di Neurologia Psichiatria E Psicoanalisi. R. Stabilimento Tipographico Francesco Giannini & Figli, Naples, Italy. 97 pp.

Badania Eksperymentalne Nad Znaczeniem Wspolzawodnictwa. Warsaw, 1923. 79 pp.

Boletin de la Direccion de Salubridad Pulica. Lima, Peru. 242 pp.

Brains in Business. Frank A. Nagley. A. C. McClurg & Co., Chicago, LII. Price $2.00. 317 pp.

Child, His Nature and His Needs. *M. V. O'Shea.* *Children's Foundation*, Valparaiso, Ind. 500 pp.

Education of Gifted Children. Lulu M. Stedman. World Book Company, Chicago, Ill. Price $1.80. 192 pp.

Eye-Sight Conservation. Eye Sight Conservation Council, Bulletin 4, Times Building, New York City. Price 25 cents. 32 pp.

Fundamentals of Social Psychology. Emory S. Bogardus. The Century *Company, New York. 479 pp.*

Fundamentals of Vocational Psychology. Charles H. Griffits. Macmillan Company, New York City. 372 pp.

Influence of Specialized Training on Tests of General Intelligence. Katharine B. Graves. Teachers College, Columbia University, New York City.

Leadership of Advertised Brands. G. B. Hotchkiss and R. B. Franken. Doubleday, Page & Co. *Price $2.00. 250 pp.*

Manpower in Industry. Edward S. Cowdrick. Henry Holt & Co., New York City. Price $3.25. 388 pp.

Mastery of Fear. William S. Walsh. E. P. Dutton, New York City. *Price $2.00. 315 pp.*

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[1] Mention here does not preclude further comment.

Progress and Elimination of School Children in Illinois. CHARLES W. ODELL. Bulletin No. 19, University of Illinois, Urbana, Ill. Price 50 cents. 76 pp.

Psychoanalysis and Aesthetics. CHARLES BAUDOUIN. Translated from the French by Eden & Cedar Paul. Dodd Mead & Co., Price $4.00.

Psychological Tests in Business. A. W. KORNHAUSER AND F. A. KINGSBURY. University of Chicago Press, Chicago, Ill., Price $2.00. 194 pp.

Psychologique. HENRI PIERON. Librairie Felix Alcan, 108, Boulevard Saint-Germain, Paris. 644 pp.

Psychology and Service. Bulletin of State University of Iowa, Iowa City, Iowa. 10 pp.

Religion and the Mind of Today. JOSEPH A. LEIGHTON. D. Appleton & Company, New York. Price $2.50. 372 pp.

Revista de Psiquiatria y Disciplinas Conexas. HERMILO VALDIZAN AND HONORIO F. DELGADO. Vol. V., No. 2. Casilla 1589, Lima, Peru. 192 pp.

Tests for Vocational Guidance of Children Thirteen to Sixteen. HERBERT A. TOOPS. Columbia University, New York City. Price $1.60. 158 pp.

Three Problem Children. Joint Committee on Methods of Preventing Delinquency. Publication No. 2. 50 E. 42nd Street, New York City.

Visual Education. FRANK N. FREEMAN. University of Chicago Press, Chicago, Ill. 391 pp.

PUBLICATIONS ISSUED BY THE DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

- *Industrial Schools for Delinquents 1921–22.* FRANK M. PHILLIPS. Bulletin No. 2, 1924. Pp. 22.
- *Kindergarten Progress from 1919–20 to 1921–22.* NINA C. VANDEWALKER. Kindergarten Circular No. 16, May, 1924. 4 pp.
- *List of Publications Available Frebruary, 1924.* Superintendent of Documents. 24 pp.
- *Salaries of Country Teachers in 1923.* ALEX SUMMERS. Rural School Leaflet No. 24. April, 1924. 29 pp.
- *Statistics of Kindergartens 1921–22.* Bulletin No. 58, 1923. Frank M. Phillips. 7 pp.
- *Study of Distinguished High School Pupils in Iowa.* Bulletin no. 46, 1923. Price 10 cents. 58 pp.

INTELLIGENCE RATINGS AND SUCCESS OF NURSES IN TRAINING[1]

HERMAN H. YOUNG

Indiana University

This study was undertaken at the suggestion and conducted with the coöperation of Mrs. Ethel P. Clark, Director of the Indiana University Training School for Nurses, Robert W. Long Hospital, Indianapolis, Indiana. Mrs. Clark introduced the use of intelligence tests into the Training School during the school year of 1919, and has since then regularly had all students tested. Two different tests have been employed in testing 122 student nurses. As it is impossible to make a direct comparison between the two tests, this paper is based upon the intelligence test results of the larger group of 101 students who were given the Indiana University Mental Survey Test, Schedule D, as employed by Prof. W. F. Book[2] and reported in "The Intelligence of High School Seniors" and as employed by Dr. O. H. Williams[3] in his Indiana state mental survey of recruits to the teaching profession. Professor Book made his survey in the spring of 1919. He secured intelligence test ratings on all the high school seniors for the state of Indiana, a total of 6188. In the summer of 1922 Dr. Williams in his survey got intelligence test ratings on all the beginning teachers who were present in summer schools in

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[1] This paper was read by Mrs. Ethel P. Clark, Director, Indiana University Training School for Nurses, before the annual meeting of the National League of Nursing Education, Swampscott, Mass., June, 1923.

[2] Book, William F., The Intelligence of High School Seniors, New York, The *Macmillan Company*, 1922.

[3] Williams, O. H., A Mental Survey of the Recruits to the Teaching Profession of a State, Dissertation for Doctor's Degree, Department of Psychology, Indiana University. To be published.

Indiana, a total of 2624. All these beginning teachers were high school graduates. About two-thirds of them were taking their first training preparatory to teaching. The other one-third were teachers who had had one year of experience and had returned for their second summer.

The student nurses from the training school and the teachers of Dr. Williams' survey were graduates from high schools. The seniors tested by Professor Book took the tests a short time before graduation. This made individuals of all three groups have so nearly the same educational background that they may be reliably compared on this basis. Accepting the general assumption that mental maturity is reached at the age of fifteen or sixteen, these three groups are comparable in this respect also, because all had reached or recently passed this age.

In the present stage of development of intelligence testing it is impossible to state in absolute and precise terms just how much ability an individual or a group of individuals possess. All that can be done is to make a comparison between individuals of the same group or between groups which have certain fundamental bases of similarity. Probably the best that can be done in the present survey is to compare the nurses with the teachers and with the high school seniors referred to above. This would seem to be fair and significant, because all three groups had approximately the same stage of mental maturity and had practically the same educational status at the time they were tested. Because the high school senior group is the largest and because it is more homogeneous with respect to age of its individuals, and their educational status, it will be taken as the fundamental basis of comparison. Unfortunately it is impossible to state with any exactness the intelligence of high school seniors as compared with the intelligence of all human beings of the same age. We are therefore forced to accept as our standard a rather indefinite notion of high-school-senior ability. Although this is not satisfactory, it furnishes a working basis and provides a point of departure in analyzing the mental ability of individuals who are at or have just passed the high school senior educational stage.

To facilitate comparisons the high school seniors were arranged in rank order according to the scores which they made on the intelligence test. The individual making the highest score was placed at the head of the list and the one making the lowest at the bottom of the list. They were then divided into 100 equal groups. Each group therfore contains 1 per cent of all seniors tested. Starting at the bottom of this rank order arrangement the highest score made by the poorest 1 per cent of the seniors was located, the highest score made by the poorest 2 per cent was located, the highest score made by the poorest 3 per cent was located, etc., for each successive per cent of the entire group up to the highest score or the one hundredth per cent. As each of these groups contains exactly 1 per cent of the entire group, each may be referred to as a percentile. The lowest of the one hundred groups is the first percentile, the next lowest of the groups is the second percentile, the third group is the third percentile, etc., until the 100th percentile is reached. The first percentile means that 99 per cent of the high school seniors made better records on the test. The second percentile means that 1 per cent did worse on the test and that 98 per cent did better. The twentieth percentile would therefore indicate such a record on the test that 19 per cent of the high school seniors did worse and 80 per cent did better. The fiftieth percentile occupies that position which indicates that 50 per cent of the high school seniors did worse and 50 per cent did better. In a general way the fiftieth percentile may be thought of as the average.

INTELLIGENCE TEST RATINGS OF 101 NURSES IN TRAINING

The scores made by the nurses were evaluated in terms of percentiles on the percentile table worked out for the high school seniors. Their distribution is shown in chart 1. The numbers across the bottom of the chart indicate percentiles. They are divided into twenty groups of five percentiles each. The 0–4 group means that in the chart above it are indicated the percentages of the high school seniors and of nurses making percentiles 1, 2, 3, and 4; the 5–9 group includes all who made percentiles 5, 6, 7, 8 and 9. The numbers at the left of the chart indicate percentages. The height of the graphs shows the percentages respectively for: (1) high school seniors, (2) high school seniors choosing nursing for life work and (3) student nurses, whose percentiles lie within each of the percentile groups indicated at the bottom of the charts. As the high

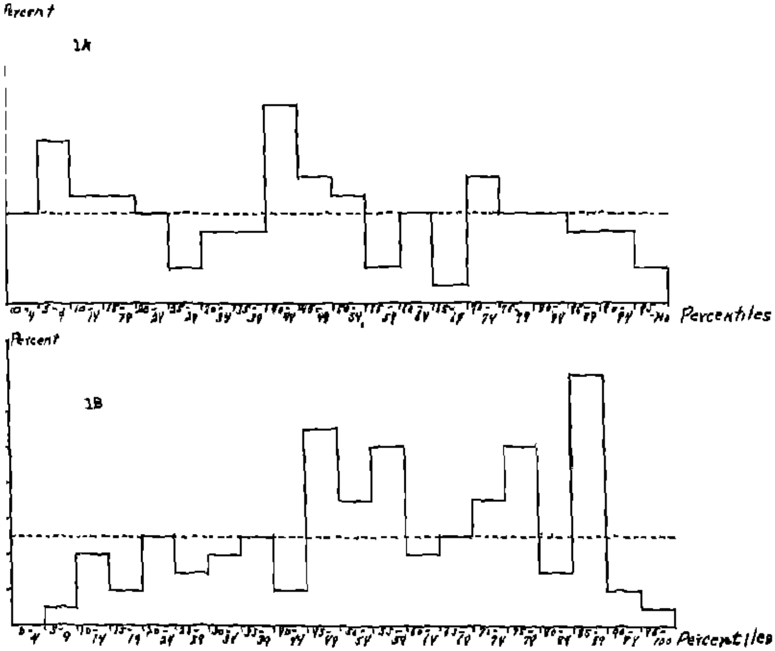

Chart I. Percentile Distribution of Nurses Compared With High School Seniors
In both 1A & 1B --- 6158 High School Seniors
In 1A only ___ 101 High School Seniors Choosing Nursing for Life Work
In 1B only ___ 101 Nurses in Training

school seniors were divided into 100 equal groups, called percentiles, each percentile contains 1 per cent of the entire group. Each of the twenty intervals represented at the bottom of the chart therefore contains 5 per cent of the entire high school group. The high school seniors are represented by the horizontal dotted line across the charts at the level of 5 per cent.

The percentage of student nurses falling within each of the percentile groups is indicated by the unbroken line on chart 1 B. Professor Book in his survey of the Indiana high school seniors asked each to indicate her choice of life work.[4] Of the high school senior girls, 101 indicated nursing to be their choice. The percentage of these 101 girls which falls at each of the percentile intervals is indicated by the unbroken line of chart 1 A. The chart shows that the high school seniors who chose nursing as their life work are more numerous in the lower percentiles than in the upper. As a matter of fact they are below the average for high school seniors. Their median percentile is 45, while that for all the high school seniors is 50. The student nurses actually in the Indiana University training school are above the average for high school seniors. They have a median percentile of 58. This is 8 percentile points above the median for high school seniors, and 13 percentile points above the seniors who said they intended to take up nursing. This gives a different picture of the nurses of the Training School than would be expected from the 101 high school seniors who signified nursing to be their choice of a life work.

When comparing the nurses in training with the teachers in training[5] it was found that the average for the nurses was 7 percentile points higher than the average for the teachers.

Student nurses of the Robert W. Long Hospital are therefore a superior group when compared with the high school seniors of the state and when compared with the young people entering the teaching profession. There are two outstanding reasons for the mental superiority of the nurses in the University training school. The first of these is that the school is maintained on an educational plane equivalent to that of the other university departments. The second is the fact that the training school has a six months probation period during which time those incapable of doing the work are dropped.

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[4] Book, W. F., op. cit.

[5] Williams, Oscar H., op. cit.

EFFICIENCY RECORD ON PRACTICAL WORK

This superiority of the nurses of the Training School on intelligence tests is specially significant if those who make high records on intelligence tests do better practical work than those who make low records on the tests. As a partial answer to this question 30 nurses were selected for special study. One group which shall hereafter be designated as Group A, contains 10 nurses with high percentile ratings; the second group to be known hereafter as Group B contains 10 nurses with percentile ratings near the average of the group of nurses; and the third group, to be known hereafter as Group C, contains 10 nurses with low percentile ratings. The exact location and distribution of these 30 nurses is indicated in table 1. The percentiles from 0 to 100 grouped in intervals of five are indicated by the numbers of the first column at the left. The second column, headed Distribution of Nurses, shows just where each of the 101 nurses fell according to percentiles for high school seniors. The third column gives the location and distribution of the 30 nurses selected for special study. The fourth column indicates the designation of the group A, B or C to which the individuals belong. The fifth column gives the median percentile for each of the three groups.

A system of efficiency records on practical work has been introduced into the training school by Mrs. Ethel P. Clark, the director. Every nurse while in training is rated by each of her instructors and head nurses on (1) personality, (2) professional fitness, (3) good points, (4) weak points. A three point system of rating is employed in the personality and professional fitness factors. The various factors rated under each of these headings is given in the accompanying charts. Each instructor and head nurse rates the students on all of these factors by indicating whether they possess them in a high degree, in a fair degree, or in a very weak degree. After a student has been in training a couple of years and has received ratings on all these factors for all her services, she has as many ratings on each of these factors as she has had services. These ratings furnish a reliable index of the student's success in practical work and provide the best available basis for determining any relationship which may exist between success in nursing and rating on the intelligence tests.

The thirty specially selected nurses already referred to, were selected because they had a large number of ratings. If there is any correlation between intelligence test results and success it should be revealed by comparing those individuals who are most different in respect to one or the other of these factors. It was for this reason that 10 student nurses were selected from those making highest percentiles on the intelligence tests, 10 from those making average percentiles, and 10 from those making lowest percentiles. If these groups do not show differ-

TABLE I

Percentile distribution of 101 nurses and of three groups of 10 each selected for special study

PERCENTILES	ALL NURSES	THIRTY SELECTED NURSES		
		Percentile distribution	Group designation	Median percentile
95–100	1			
90–94	2	2		
85–89	15	5	A	87
80–84	3	3		
75–79	10			
70–74	7			
65–69	5			
60–64	4			
55–59	10	6		
50–54	7	1	B	55
45–49	11	3		
40–44	2			
35–39	5			
30–34	4			
25–29	3	2		
20–24	5	3		
15–19	2	2	C	18
10–14	4	2		
5– 9	1	1		
0– 4				

ences in their success it is doubtful whether we could expect to find differences existing between any groups. If differences exist between these groups it would be fair to assume that differences in intelligence test results have some value as indices of success.

In order to make comparisons between the three groups, the total number of ratings on each factor given the students of each group were computed. Chart 2 shows the percentage of "high degree" ratings received on each factor by each of the three groups. The factors are arranged across the chart in rank order for Group A. The numbers at the left of the chart indicate per cents. On truthfulness the line beginning at 92 means that 92 per cent of all the ratings on truthfulness of the Group A students were for "high degree" of truthfulness, i.e., being very truthful. This line crossing "sense of humor" at percentage level 82 means that 82 per cent of the ratings on "sense of humor" indicated it to be present in "high degree." This line crossing the chart shows the percentage of ratings received by the Group A students on "high degree" of each factor. The percentages of "high degree" ratings for Groups B and C were computed and plotted in the same way with the results as indicated by the other two lines of the chart.

Chart 3 gives the same results for *professional fitness* as does chart 2 for *personality*.

In giving ratings on good points and weak points the three point rating system already referred to was not employed. The instructors and head nurses made ratings on them by indicating the student's strong points and weak points when sufficiently marked to warrant being rated. They did not rate them on any points except those where their strength or weakness was especially marked.

Chart 4 shows the percentage of ratings on each of the good points for each of the three groups. The list of factors is arranged across the bottom of the chart according to the rank order arrangement of these factors for Group A. The line beginning at percentage 72 means that in 72 per cent of their services *intelligence* was a good point revealed by students in

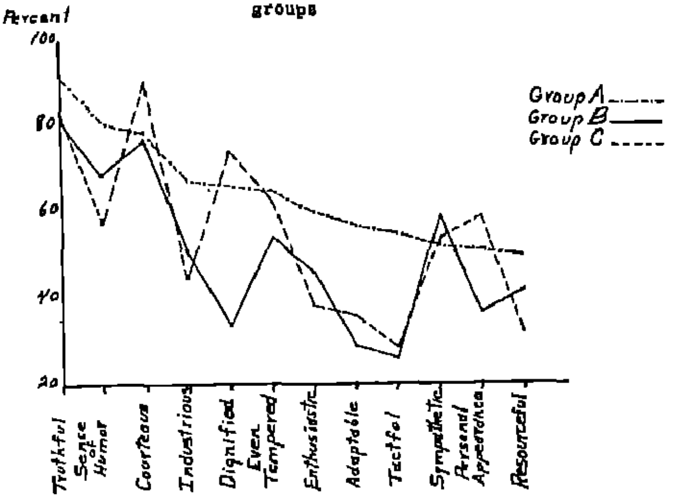

Chart 2. Personality Ratings. Percentage of very superior ratings of the three selected groups

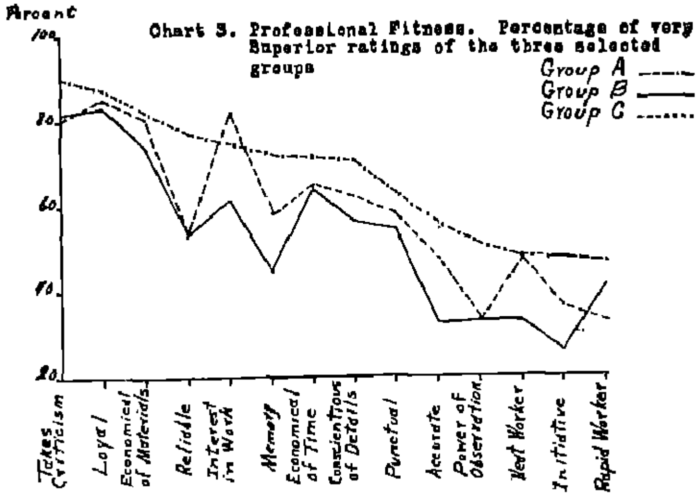

Chart 3. Professional Fitness. Percentage of very Superior ratings of the three selected groups

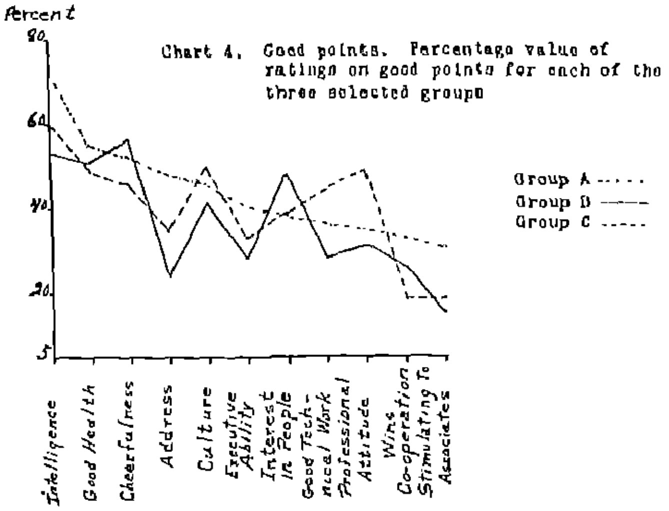

Chart 4. Good points. Percentage value of ratings on good points for each of the three selected groups

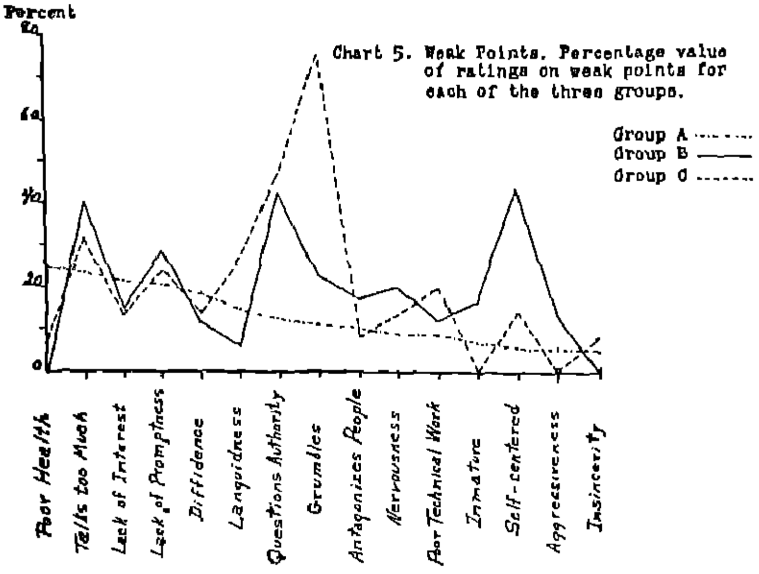

Chart 5. Weak Points. Percentage value of ratings on weak points for each of the three groups.

Group A. The line then crosses *good health* at percentage 55. This means that in 55 per cent of their services good health was one of the good points for the Group A students. The percentage value of each of the other factors is represented in the same way. Percentage values for good points on the same services for groups B and C were computed and plotted by following the same plan.

Chart 5 gives the same data for weak points as the preceding chart does for good points.

Casual observation of charts 2, 3, 4 and 5 shows that Group A rates consistently higher on an average than the other two groups. Actual count shows that out of the 52 factors rated Group A rates higher than Group B on 44, and higher than Group C on 37 factors. Group C rates higher than Group B on 31, or 5 more than half of the 52 factors. In this connection it must be remembered that in chart 5, on weak points the lower percentages mean better ratings.

On the basis of success in practical work as judged by instructors, those student nurses who rate highest on intelligence tests make progress and success distinctly better than those who rate only average and below on the tests. It cannot, however, be concluded that success varies directly with test results, because on an average the students of Group C rated slightly higher than the students of Group B. These summary statements are based upon a mere counting of the factors rated as if all were of equal value in nursing. Undoubtedly these factors are not all equally essential in nursing. Until we know definitely the relative value of each, we must be content to treat them as equal. Only the fact that this is a preliminary study of the value of intelligence tests in selecting nurses prevents some of the interesting and apparently very insignificant features of the charts from being analyzed further. The suggestion is strong that each factor has a value very different than every other one. On four of the 12 personality ratings on Chart 2 the students of Group C rate above those of Group A. The four factors are (1) *courteous*, (2) *dignified*, (3) sympathetic, and (4) personal appearance. These four factors stand in interesting contrast to the other eight. The other charts give equally important suggestions for analysis of the essential factors which make for success in each of the three selected groups of students.

SCHOLARSHIPS IN THEORETICAL STUDIES

At Indiana University a credit point system is used. Each grade has a definite value in credit points. The average value of the grades in credit points for the University is 1.3. The student nurses of Group A made an average of 1.9 credit points, of Group B of 1.7 and of Group C of 1.6. Three significant features of this comparison of credit points are: (1) that the average in credit points for the three groups of nurses varies directly with their rating on the intelligence test, (2) that even the lowest, the Group C students, rate considerably above the general University average, and (3) that Group C ranks only a very little lower than Group B. This last fact taken with the one previously noted, that Groups B and C rated nearly the same on their practical work, indicates that coming from such a highly selected group the actual differences in ability are not so great as the numerical differences between the percentile ratings of the groups suggest.

SUMMARY

The Indiana University Training School for nurses employs a six month's probation period in the selection of its students. Unpromising students are dropped during this probationary period. Efficiency records are not kept on probationers. All comparisons of this paper are based upon the intelligence test results and work of student nurses who survived the probationary period. The student nurses reported here are a relatively highly selected group, because they have survived the selective process of the high school and the probationary period of the training school. The selectness of the student nurses is also indicated by the following facts:

1. On an average they rate 8 percentile points above the average for high school seniors.

2. Only one student nurse falls below the tenth percentile, or all except one come from the upper ninety per cent of high school seniors. Nearly two-thirds of the nurses rate above the average for high school seniors.

3. They rate 13 percentile points above the Indiana high school senior girls who reported nursing to be their choice of life work.

4. On an average they rate 7 percentile points above the average for Indiana teachers in training.

5. The average number of credit points earned by even the lowest group of nurses is distinctly higher than the average for the entire university.

These facts indicate that even the nurses rating lowest on the tests are superior as compared with our general population. They are inferior only as compared with the highly selected group of nurses of which they are a part. This study indicates that the modern system of intelligence testing is of definite value. In the course of an hour it so distributed the members of this highly selected group of student nurses that when the test results are checked up with the progress and success of the students in training the following observations are apparent:

1. The students rating highest on the intelligence test, made distinctly the highest average in both their theoretical studies, and their efficiency record on practical work.

2. There is no significant difference between the efficiency records on practical work of the students who rated lowest and those who rated average on the tests, neither is there much difference between these two groups on the number of credit points earned in theoretical studies.

3. The average number of credit points earned in theoretical studies by each of the three selected groups of nurses varies directly with their ratings on the intelligence test.

The intelligence test results correlate higher with theoretical studies than with practical work. This may be the result of some special characteristics of these group intelligence tests or of some special features operating in the assignments of grades in theoretical studies or in the nature and use of the ratings on practical work.

MALADJUSTMENT AMONG COLLEGE STUDENTS

ZOE EMILY LEATHERMAN AND EDGAR A. DOLL

From the Psychological Clinic of the Ohio State University

The inadequacy of traditional methods for the solution of the problems of maladjustment among college students is tacitly admitted by the futile manner of handling them. Such measures as suspension, expulsion, or transfer to another school, do not solve these problems from the standpoint of the individual; they merely remove *him* from the campus. However, educators are gradually realizing that behind every problem of student misconduct is a cause or causes of which the student himself may be absolutely unaware. This new approach to a familiar problem is now evident on many a college campus in the number of agencies that act as student advisors (1), as well as by the courses offered in "Fundamentals of College Life" (9, 11), or "College Problems" (12) required of Freshmen in some schools, in which curricula, social opportunities and problems of vocational choice are discussed by selected faculty members.

It is the purpose of this paper to make a brief survey of some of these college problems, with an analysis of the causal factors, and some suggestions as to their solution, with special reference to the large universities.

A study of campus maladjustments reveals problems that may be grouped as follows:

1. Scholastic. These are perhaps the first to be recognized. In this list are found such difficulties as:

1. Failure in studies.
2. Special disabilities in certain subjects such as mathematics, or the languages.
3. Class room dishonesty, such as the attempt of an inferior student to pass work which was hard for him, or for which he was not prepared.

4. Illegible handwriting.
5. Speech defects.
6. Changes in courses and sections after the work of the quarter is well under way.
7. "College tramping," typified by the student who transfers from college to college within a university for no evident reason.

2. Social. The College Deans have been most closely and vitally interested in this second group, which falls into two subgroups in proportion to their seriousness from the point of view of college discipline.

A. Minor maladjustments, such as:
    1. Disobedience to college rules.
    2. Inability to "get along" with others in dormitories or boarding houses.
    3. Forwardness, or its opposite.
    4. Lack of initiative.
    5. "Crushes."
    6. "College engagements" of various types.

B. Major offenses, which would in fact bring the student before the civil law if it were not for our American custom of delegating the discipline of students to their faculty authorities. These are more frequent in number than is commonly realized, but include comparatively few types, such as:
    1. Larceny of various sorts and degrees.
    2. Forgery.
    3. Sex offenses, major and minor.
    4. Drinking or trafficking in intoxicating beverages.

3. Personal. This division of the subject includes problems which rarely, if ever, come to the official attention of any school. Only those faculty members who enjoy a close enough personal acquaintance with the student to warrant confidence in their greater experience and understanding, realize the number and distressing seriousness of these problems. The difficulties include:

1. Worry over financial matters or personal or family troubles.
2. Illness and physical defects.
3. Nervous disturbances of all degrees of severity.
4. Actual mental disorders, amounting in some cases to actual insanity.
5. Morbid seclusiveness.
6. Religious difficulties.

The Student Health Service (in schools where this is established) or the school nurse or doctor, are doing an important service in handling some of these problems, especially in preventing illness and contagious disease. (They should be given all possible support in their work.)

Professor Laird (7) expresses himself on these matters as follows:

> It is not Providence, bad heredity, or native stubbornness that has brought about these twists and kinks [of behavior]. They are the result of perfectly understandable mechanisms, and just as they have a natural genesis, so they are amenable to a natural treatment. Discipline committees, flunking, public ridicule, or moral condemnation are not forms of rational treatment.

The psycho-educational clinics in the public schools have shed light on some of the similar difficulties met earlier in the educational life of the individual. Let us see whether further light on the college problem might be secured from this same source, and for this purpose turn, for the time, from the point of view of the educator to that of clinical psychology in an attempt to analyze the causes which underly these troubles of the college student.

Upon analyzing these problems, certain common causal factors appear, somewhat fewer in number than the diverse nature of the situation as just described, would lead us to expect. These group themselves under four heads: mental, physical, environmental, and emotional.

I. MENTAL CAUSES

Mental causes are receiving much greater recognition since the group mental tests have made it possible to ascertain the relative mental level of all members of the student body in a comparatively economic manner. While it is true that no group test is a sufficiently accurate measure of any given individual, experience has proved that in the large number of cases, this rating is a usable measure, as is shown by the increasingly large number of schools in which such tests are a part of the routine procedure in the admission of students. But valuable as this new approach has proved, it has definite shortcomings for we find marked discrepancies between test scores and class room records. This shows that the factor of general intelligence is not the only one involved. Let us examine these factors, and discuss each as it is named, in an attempt to solve this problem.

1. Persons of low intelligence of the feeble-minded level are rarely successful in reaching college. There are, however, many of the "inferior normal" grade that do enroll, and some of these, by continued effort, and by remaining longer than the usual four years, actually obtain a degree.
2. Scholastic inferiority without intelligence defect is a condition resulting in some instances from emotional disturbance (q.v.) or it may be the result of:
    - *a.* Premature attempt to carry advanced work.
    - *b.* Poorly arranged sequence of courses.
    - *c.* Lack of definite objective i.e., no life-plan for which the college work is conceived to be a more or less definite preparation.
    - *d.* Special disability, such as poor visual or auditory memory, arithmetical disability, or lack of "language sense."
    - *e.* Poor previous preparation.
3. Definite psychiatric condition (insanity). This group is not important for its size, but because of its seriousness. Dr. H. Shindle Wingert, Director of the Stu-

dent Health Service of Ohio State University in an unofficial estimate states that possibly the number of actual psychiatric cases in any one year on the campus would not exceed twenty. However, no definite figures are available. Dr. Barrett of Michigan University, Department of Psychiatry sees about 25 student cases per year, most of whom who are referred by University Student Health Service. Cases of psychic epilepsy (epileptic equivalent, hysteric pseudo-epilepsy) are on record, one suspected case having been sent to the Ohio State University psychological clinic this quarter.

II. PHYSICAL CAUSES

The relation of poor health to poor academic standing needs little comment. There are, however, disturbances of internally secreting glands which do not cause illness in the ordinary sense in which the word is used, but which interfere with the efficiency of the student's physical and mental life. Among women, the thyroid gland is a particularly frequent cause of trouble. This is the province of the school physician, but we may list the following as examples of physical causes:

A. Chronic disease, or acute illness.
B. Sensory defect. Under this heading would come defective eyesight, and poor hearing.
C. Unhygienic living, such as
    1. Insufficient sleep.
    2. Insufficient food, or badly planned meals.
    3. Bad living conditions.
    4. Improper clothing.
    5. Lack of outdoor exercise.
    6. Lack of recreation.
    7. Slovenly personal habits.

III. ENVIRONMENTAL CAUSES

In this group also, enumeration will suffice in most instances, to show the relationship between the cause and effect.

A. Too many outside activities.
    1. Social pursuits.
    2. Self-support.
B. Too frequent visits home.
C. Lack of application.
D. Inability to make proper use of time.
E. Slow adaptation to new environment. This is especially evident in the case of students whose high school work was done in a small community when they enter a larger university in a city.
F. Bad companions.
G. Faulty home training ("perverse habituation trends").
H. Excessive parental sympathy.
I. Lack of home encouragement.
J. Too much spending-money.
K. Family worries (especially divorce of parents).

IV. EMOTIONAL CAUSES

For the college student the ordinary adjustments incidental to adolescence present unusual difficulties.

> He has to adjust himself to a new environment and to a new group of associates. He wishes to be well thought of by his companions, to stand well in his studies, to be prominent in college activities. He does not understand why he finds it so difficult to be his natural self, so that his sterling qualities may be recognized. He may be over-sensitive to the remarks or actions of others, or he may develop a feeling of inferiority. As a result he may lose interest in his work and play, find it hard to concentrate, become restless, and worried, and develop general physical complaints (10).

Williams (15) has said that these experiences are common, and that "there is not one of us but has his psychic scars of this period." Laird (7) has also said that love of social esteem is the force that rules college life. This he illustrates by reference to the types of songs which are most popular—the ones expressing this gregarious tendency. He has made a list of "complexes" which we present here, with some changes and additions:

1. Greek letter complex.
2. "Date" complex.
3. Athletic complex.
4. Grade complex.
5. Inferiority complex ("Hick" complex).
6. Parent complex.

Beside these designated as complexes, there are certain other worries of an emotional nature, for example:

1. Antipathy to some instructor.
2. Antipathy to required subjects.
3. Fear of being dismissed from the university.
4. "Crushes" on faculty women and students.
5. Sex experiences, real or psychic.

That these problems are found in real life, Professor Laird shows by a list of cases which he has studied in the University of Wyoming. That something may be done to help such students he has also shown.

These results are verified by the studies of Dr. A. W. Morrison (10) of the University of Minnesota, as well as by the work of Dr. William Healy (3, 4, 5) with the adolescent outside the university. Studies made at Ohio State University in the Psychological Clinic also confirm these findings, and give a reasonable basis for hope that definite contribution to the solution of college problems can be made. Later in this paper, cases will be reported in some detail to confirm this statement.

A search of the literature on the subject shows that recognition is just beginning to be given to the problem, and that here is a field which promises much valuable help to the problems of education as that term is used in its broadest sense to mean preparation for successful adult participation in life.

> If the college is to prepare adequately for life, measures should be taken to see that the students are mentally adapted to life as it is, instead of graduating *cum laude* and *cum* also bitterness, cynicism, inadequacy, emotionalism, paranoidism and shoddy idealism (7).
>
> Mental hygiene studies are proving conclusively that the mental factors leading to success in life are preponderatingly emotional and dynamic factors, together with those elements that have to do with control and balance. When we study men of eminence, for example, we are

> often impressed not so much with intellectual acumen and agility, but with energy, enthusiasm, sustained activity, courage and the like. When, too, we investigate social failures, we find in many instances, individuals not particularly lacking in intellect, but deficient in those subtler qualities that seem to be the springs of conduct. Certainly the whole question is deserving of the attention of university authorities. The college gains no prestige when it puts its stamp of approval upon the intellectual gymnast who proves to be a failure outside of college walls (6).

Much more could well be said on the emotional causes of college problems, but that must be left for a more extended study than is the scope of this paper. Enough has been said to open the way for further study and investigation. This is simply an entering wedge. The field is a very attractive one, but we must hasten to an inspection of some actual cases, for armchair generalization is valuable only as it is based on facts which can be verified in the laboratory and in other actual life situations.

CASE STUDIES

A. *Introduction*

The following are reports of actual cases studied in the Ohio State University Psychological Clinic. These cases are typical of the variety of cases served by the clinic. They indicate the lay complexity of the maladaptation and the comparative simplicity of diagnosis and treatment. They are typical of many others. During two university quarters there have been at least twenty-five such cases. Some of these came in of their own volition, others were sent by the Dean of Women, and others by the various instructors. Consultation through a third person has been given in about eight cases, in which it was impossible, or inadvisable for the student concerned to be brought to the clinic for direct help. No special effort of publicity has been made to secure these cases.

The Clinic has been seriously handicapped by certain difficulties which should be mentioned here.

1. Lack of suitable medical contacts to provide for the physical diagnoses which are essential in all such cases, both for positive and negative data.
2. Lack of suitable examining quarters in the present laboratory. Privacy and freedom from distractions are essential to confidential interviews and adequate examinations.
3. Lack of knowledge on the part of faculty, administrative officers, and student body that such service is available (without this we have had all the cases that could be handled with our present staff and equipment).
4. Lack of objective tests for persons of the higher intellectual ranges.
5. Lack of adequate examination technique.
6. Lack of routine measures of procedure.
7. Lack of opportunity for adequate "follow-up" work.
8. Lack of time to make proper study of cases.

B. Procedure

This varies with the type of case. The first thing, however, is a statement of why the individual comes or is sent to the Clinic. This furnishes a point of departure. The ordinary clinical procedure then comprises:

1. Life history.
2. School history.
3. Patient's account of present problem.

All these three will be of varying degrees of importance, and are used in different order, depending on the type of problem.

4. Objective tests. These are not absolutely necessary in every instance, but should be applied as completely as may be possible in each case. Those that have proved helpful are listed here. This is not an exhaustive list, but merely a list of those that have been used in the various cases reported in this study.
    a. Verbal tests, including such standard tests as the Ohio Literacy test, Short Army Alpha,

Morgan Mental Measure, Toops Language test, O. S. U. entrance test, and Stanford Binet.

b. Non-verbal tests, such as the Porteus maze tests, Witmer and Ferguson form boards, Myers Mental Measure, Healy Pictorial Completion, Stenquist Assembling tests, Stenquist Aptitude tests, and the like.

c. Anthropometric measures such as height, weight, vital capacity, strength of grip.

d. Psychiatric tests and "complex detectors," such as, the Kent Rosanoff Association test, orientation tests, Woodworth and Wells test for emotional instability.

e. Psycho-analysis (not necessarily in the Freudian sense).

I. A case of handwriting disability. A woman student, Ed. 3, majoring in English, consults the Clinic of her own volition regarding a disturbance in handwriting. Ordinarily capable of a good script, there are times when she is incapable of writing legibly. She also complains of nervousness, worries, and general maladjustment. Preliminary examination shows obvious physical disturbances such as overweight, defective vision, bad teeth, goiter, and probable heart weakness. There are evidences of speech defect, mild neuro-psychiatric complications, and emotional disturbances as well as mental conflicts or complexes. A physical examination is recommended, an analytic psychological study suggested and some mental hygiene advice given. Owing to the closing of the quarter, time does not permit following up the case, and she does not return of her own accord. *This girl will probably suffer a nervous breakdown unless assisted to overcome her mental and social difficulties. She is mentally unfit in her present condition to continue her studies or to prepare for teaching.*

II. A case of speech defect. A young man, Arts 2, consults us of his own initiative regarding an unusually bad speech defect in the form of intermittent stammering. He is of average intelligence, and doing passing work in his studies. There are no evident signs of mental or physical abnormality. Speech is normal at home, with friends, when excited, and when in good mental and physical condition. Speech is intermittently normal during the examination. A brief analysis of his history shows a persistent fear of stammering which acts as an inhibitor of free speech, with strangers, or when fatigued, nervous or ideationally disturbed. The preliminary analysis further reveals the cause of the fear complex in a series of events (sickness, fear, imitation) in early childhood. The student is advised regarding the harmfulness of the "corrective" measures he has followed which have in fact only aggravated the defect. The causes of his defect are made clear and he is advised how to rationalize them. He will return for further analysis, objective testing, continued advice, and possible corrective methods.

III. A case of sex perversion. A theological student, aged 30, comes from Springfield to consult about persistent homosexual mal-practices. He is guilty of frequent masturbation, and manustupration with young boys. He wishes to visit the ward for sex perverts at some state hospital for the insane, in order to build up a stronger feeling of repugnance against the habit over which he has no self-control. He is found to be a young man of superior intelligence, character, education and aspirations. He recognizes the seriousness of his abnormal conduct and is fully alive to the disastrous consequences to his career and good name if not overcome. He is now liable to a prison sentence if convicted before a court. An analysis by means of detailed inquiry into his personal history reveals some apparent sources of his misconduct and assists him to see how to regain his self-control. Suggestions are given regarding the nature of the mental and physical factors involved and how to control them. He is immensely relieved and assures us that the information imparted has saved him from mental collapse, and will surely inspire and aid him to regain his self-control. He is urged to consult us further in case of continuation or relapse.

IV. A case of inability to learn. A pre-medical student, Arts 2, now on probation, consults us on his own volition regarding an "inability to learn from books." He states that he can not learn from books or from group instruction in spite of conscientious effort and in spite of good ability and successful previous academic record. The examination shows a man of sincere purpose, sound character, strong personality and high intelligence who apparently suffers from disturbed motivation and the inferiority complex. The disability has developed apparently on a subconscious basis of mental conflict due to a desire to assume larger responsibilities, and unusual paternal affection. There is a history of strong adolescent shock with suggestions of a father complex, normal in type, but exaggerated in degree. This case is now under consultation. The analysis has already gone far to reestablish self-confidence. Corrective measures have already been indicated. We are confident of ultimate rehabilitation.

V. A case of dropping work in the midst of the quarter. A young woman student, Arts 1, 18 years old, is referred by the Secretary of the College of Arts for a statement as to her ability to carry Psychology 401, which she is failing and desires to drop. Examination shows her to be of somewhat above average mentally, capable of carrying university work suited to her class rank, and of securing above average grades. An intensive study of her study schedule reveals poor planning of time in the work of the second quarter. She says that she has deliberately chosen to put more time on history, to save her credit on that course which is continuous throughout two quarters, and if anything has to suffer, she thinks it best to select something involving only one quarter's credit. Advice regarding the more efficient planning of her work, encouragement to do her best to pass all her work, and a little talk on what the college has a right to expect of one of her ability, sends her out with a promise to try her best. Her instructors report signs of more consistent application. At the end of the quarter she reports voluntarily that she has made a passing grade in Psychology, and expresses her appreciation for the help she received.

VI. A case of forgery. A young woman, Ed. 4, 20 years old, is sent to the Clinic by the Dean of Women because she has forged a check. She proves to be of inferior mentality and to have a colorless personality. She is working her way through school. Previously she has borrowed money from the girl whose pay check she signed in her own handwriting with no attempt at disguise. She has never had anything to do with banking before, and thought that this was simply a matter between her and her friend. She seems much distressed at the serious consequences of her ignorance, and says that she has learned her lesson. In the course of the examination another conduct problem is discovered, namely, a violation of woman's athletic association rules by playing on a professional team while also a member of a class team. When the facts are all learned, this proves to be an offense of a similar nature to the first —a failure to sense the importance of her own acts. She is typically inferior, mentally, socially, emotionally, and in personal bearing. She has never had adequate training at home. She is a rather hopeless case. She is advised to find some older person to whom she might go for advice about everyday affairs. The prognosis is not good. However, change to a smaller school is recommended, on the grounds that there she could receive more personal oversight. Choice of a school, and further "mental bolstering" is to be undertaken.

VII. A case of personality defect. A young woman, Ed. 4, room-mate *of case 6, is sent for study also* by the Dean of Women. The charge against her is that she was with case 6 at the time of the forging of the check, and did not attempt to stop her. This girl proves to be of much the same type as the preceding, the chief difference being a great lack of initiative and the fact that she does not have to support herself. She is also an orphan. The two girls cling to each other for mutual encouragement. As a means of developing this girl's initiative, she is encouraged to take a decided stand on all moral issues and to help her chum to do the same. There are no evidences of emotional instability, or emotional complexes. Here again is a picture of constitutional inferiority which will never succeed in a complex environment. She will never be a social problem, in a positive sense.

VIII. A case of suspected insanity. A young woman, Ed. 4, 31 years old, is sent by the Dean of Women because of suspected insanity, evidenced by "queer" actions, "hallucinations" and "undue emotionalism." Examination reveals that this is a psychiatric type of case, although there is no evidence of actual mental derangement at the time of examination. She is somewhat hysterical, her emotions are easily aroused, but her condition does not justify a diagnosis of more than instability on the basis of her present condition. Her life history is given connectedly and with much insight into two mental collapses for the treatment of which she spent two periods in private sanatoria. The first episode was precipitated by the death of her father, after a long and painful period (to the patient) of family troubles and disagreement. The patient thinks her breakdown was the result of an emotional complex, which she has almost completely rationalized. The second attack came after the patient had an illness, and immediately following her mother's re-marriage. Evidently this revived the earlier conflicts which the patient thought had been rationalized. A frank discussion of her history seemed to bring great relief to the patient, who because of the intimate nature of the difficulty and the social prominence of the family, had never felt free to confide in anyone before. Owing to the close of the quarter, and to the fact that the young woman is graduating at this time, further follow-up work on this case is impossible, however she promised to return for further help and advice. This is a case where much could be done by further analysis and frank discussion. The pity is that psychoanalytic treatment could not have been used long ago on this case.

Note: It is rather interesting to note that cases of maladjustment so frequently come to the attention of the administrative officers just at the close of a quarter, when the strain of final examinations and fatigue drive the girl to seek help. Preventive work should be begun earlier in the year, so that better follow-up work could be done, and these breakdowns prevented. Preventive work of this sort is being successfully done among the lodging pupils of the Columbus School for Girls, under the direction of Dr. Florence Mateer, and very definite decrease in strain and in "spring breakdowns" is resulting.

IX. Vocational guidance case. This young woman, Arts 1, 18 years old, comes to the Clinic for Vocational Guidance. She is found to be of average (college) intelligence, and slightly spoiled by the attention she has received because of her more than usual physical and social charm. On first interview she makes a very pleasing impression which does not however, increase with acquaintance. A study of her abilities and interests reveals a strong interest in heavy drama and the Shakespearean stage. She has some vocal ability and some ability in design. She is advised to seek expert opinion on these three lines of ability. She is also shown the best way to make use of the campus opportunities to find the thing for which she is best suited. She is discouraged from attempting newspaper reporting in which she is also interested, because of certain specific disabilities, one of which is a difficulty in the discriminating use of English (she is a Russian Jew and learned Yiddish and English simultaneously). She is instructed in the principles underlying vocational choice.

X. A case of stealing. This young woman, Arts 1, 18 years of age, of a prominent family, is sent by the Dean of Women because she stole a coat from the gymnasium locker room. Later she wore the coat on the campus where it was recognized by the owner, and after many attempts to deny the charge, confession and restitution were made. This girl is found to be on the verge of a physical breakdown as the result of infected tonsils and anemia (doctor's report). Mentally she shows the effect of the recent strain of appearing to answer such a charge. Her intelligence is above the average. She willingly enters into coöperation to discover the causes underlying her act, which is her only offense. Exhaustive study of her previous life fails to find any basis for the offense, except a possible shortcoming in her sense of ownership. This probably dates back to high school days when promiscuous borrowing of articles of apparel was the habit of the girls with whom she associated. This is fully explained to the patient who is helped to rationalize her act as being a natural consequence of this habit. She is advised to remain at home during the ensuing quarter for the purpose of regaining her health. She is to be permitted to return to school when she is able to do so, partly as a result of the findings of the Clinic in her case.

XI. A case of beginning infantile regression. A young woman student of Ohio University, Athens, is referred by friends because she is acting "queerly," absenting herself from classes, talking "baby talk," and acting in general like a child. She is 28 years old. She is seen in her room under the pretext of a friendly call. When assured of understanding she readily discussed her problem, a love affair with a man some years her junior. The situation made it necessary that she should discuss it with none of her friends, so she had tried to repress it. Frank discussion of the problem of age difference and the reason for society's attitude toward it, helps her to dissipate part of the conflict. A discussion of common sense methods of dealing with the practical aspects of the situation seems to result in the complete freedom from the disturbed state, and without any mention or suggestion, she at once resumes her normal, grown-up manners of speech and action. Her friends report that she has remained entirely normal in the months since this interview, and that she has also been in better health.

XII. A divorce case. A Graduate student, Mrs. X., in the university to finish her Master's Thesis, her year of residence being completed, comes voluntarily to the author for help to justify her separation from her husband. This appeal is the result of a chance remark made to her in a class in psychoanalysis, in answer to her question as to a possible Freudian explanation of her difficulty in writing "he" for "we" and vice versa, several times in writing her thesis. She confides the information that she has a husband and a small son, but is not living with them, although there has been no open break, her return for the degree being rationalized to her husband by her desire to teach and so help out in family finances which are rather precarious just at this time. She finds married life intolerable because of her husband's lack of consideration for her, which she says has been more pronounced since his becoming a chiropractor. He refuses to leave this occupation. Analysis of her own sex life shows a strong father-fixation. Her habits of reaction to difficult situations are the childish ones of "temper spells" or running away. Her mother has always ruled her husband by these same methods. Since Mrs. X. is something of a psychologist herself, it is possible in a very short time to show her the roots of her difficulty. Her husband responds surprisingly to a more adult attitude on the part of his wife, and the family are reunited on a better basis of understanding than ever before.

XIII. A college "crush" case. This case, which is still pending, is included to show the need which exists for a well-known, well-established agency where help for problems may be sought. In private conversation with the Secretary of the Arts College, a young woman student expresses the wish that something could be done to relieve her from the annoying attentions of an underclass woman who had become devotedly and romantically attached to her. After considerable urging, the girl reveals the name of her young admirer. The girl proves to be enrolled in the College of Agriculture. The next step was the reference of the situation to the Secretary of the College of Agriculture, who in turn referred the information to the head of the Department of Home

Economics, and she in her turn called on the Dean of Women for advice, who finally referred the case to the Clinic. Since the data were so incomplete, an interview with the Secretary of the Arts College was the next step. It was learned that the complainant had asked that her name be withheld, so a message was sent to her through the Secretary of the Arts College, to the effect that if she desired to come in person to the clinic, she could receive advice and help in handling her problem. Suggestions were also sent to her as to means for transforming this unhealthy condition into a normal friendship (fearing that timidity would prevent her consulting the clinic). Sufficient time has not yet elapsed for a report on the outcome, but the case is recorded here as another evidence of a student need of help.

XIV. A case of alleged sleeping sickness. This is a report of a case that is still under clinical observation and investigation. It is given in its incomplete state because it also illustrates concretely certain campus needs.

A young woman student, Arts 1, aged 16, consults the clinic on the advice of her instructor regarding a condition of alleged sleeping sickness with a history resembling psychic epilepsy (epileptic equivalent) or post encephalitis. She falls asleep in class and elsewhere, goes into stuporous states from which she can not be aroused, has periodic uncontrollable temper spells, accompanied by profanity, vulgarity (or delirium), of which she appears to have no recollection. The examination reveals a case of bad mental and physical hygiene, combined with emotional instability and a romantic temperament. After the second interview she presents fervid verses written in praise of the wonderful benefit her consultations have been in her life!

She overworks, undersleeps, abuses her diet, carries too much work and engages in too many social and athletic activities. She resorts to extreme measures to attract attention, especially of young men, even going so far as to undress with the blinds of her room raised high although she has been warned that she is in full view of men rooming across the street.

With a tendency toward reverie, she romances, then dissimulates and practically malingers. In three different attempts to secure a connected history of her life, entirely contradictory data are obtained, by different examiners. These data are further contradicted by facts obtained from neighbors.

A sister who is enrolled in the College of Education makes high grades, and presents no social problems. She, however, is also subject to some sort of spells in which she loses consciousness for varying periods of time.

Because of this, the patient was taken for neurological examination to a well established local physician, who reports that he finds no evidences of disturbances of reflexes, and reports that he "had a very enjoyable conversation with a young woman of unusual intelligence."

The Kent-Rosanoff association tests show clearly the existences of sex complexes, and a large number (15-10) of individual and low frequency responses. When attempt is made to approach the subject of sex experiences, the patient introduces other topics. At the same time, she was seen to be flirting with a man, a stranger to her, waiting in an adjoining office. Reports of open flirting come from every one connected with the case. As yet it has been impossible to get any real coöperation from the patient. She apparently enjoys being the center of the stage, and keeps her appointments for that reason.

Her intelligence rating on the University Intelligence tests is at the 50 percentile or Group 3. On the Morgan Mental Measure she makes a score of eighteen years, two years above her actual age.

She completed her high school course in 3 years, with honor. In her third year she took a leading part in both the junior and the senior class plays. She was active in athletics and social affairs.

Her university grades average C, with both very high and very low marks. She seems to have some talent in writing, and says that she has had a scenario accepted by Famous Players Co. Also that she has had poems printed. In the absence of tangible evidence to the statement, it must not be taken too seriously.

At the end of the third interview, a "calling of her bluff," a stiff reprimand and candid suggestions work wonders in almost immediately setting her straight and doing away with the "sleeping sickness" which has not since reappeared. In fact the "dramatizing" for effect has considerably subsided, and has turned itself more definitely into attracting the attention of men to herself. This shows in her extreme dressing as well as in her conduct.

Recently she has been called into the office of the Dean of Women on complaint of the woman for whom she was working for board and room. The trouble in this instance is connected with the same type of mild exhibitionism mentioned previously. She is said to have sat half clothed smoking in an upstairs window and to have called to men passing the house. For this and other reasons the Dean has removed her to the home of a relative in Columbus in the hope that more strict supervision will be possible.

This is indeed a maladjusted adolescent. She needs help. As yet it has been impossible to reach the root of the trouble. Adequate medical and laboratory studies have not been secured.

These case studies are presented not so much from the standpoint of diagnosis or treatment as from the standpoint of illustrating how varied are the types of maladjustment found in the course of a brief investigation on a single campus. The practical results of the clinical side of this investigation have been to show that help can be given to many if not all of the maladjusted students, that they respond with appreciation to an attempt to help them, and to show that a more complete organization of the resources for giving this help is imperative before further work can be successfully undertaken in the clinic.

It will be evident to anyone sufficiently interested to have followed this topic to this point, that the individual handling of these problem cases is expensive both from the point of time and money. *Might there not be some other method of solving* the problem? Would it not be possible to give courses in Mental Hygiene in which the minor problems could be handled by the students themselves, leaving only the most severe cases to be dealt with individually. We have no doubt that this is a possible solution. This was the basis of a class in Elementary Psychology organized by the writer in a high school of which she was principal, and the results of the work done there have been most encouraging. The attitude toward the class on the part of the students enrolled in the course, was most enthusiastic. Professor Laird has attempted the same type of experiment with college students (8), and reports that "College students are eager for instruction in Mental Hygiene especially as it affects them personally. It was estimated to be of more value to them than any other part of the course in Elementary Psychology. That it results in much personal benefit is shown by the results 'before and after taking' which will be reported in detail shortly" (8).

Wallin (14) reports the existence of sixteen university clinics, but in no instance is any mention made of work done in these clinics for the University students themselves. Anderson (1) states that "a well-known Eastern college has recently undertaken to create the position of full-time psychiatric adviser to the student body. It is believed that work of this nature would justify the most serious consideration and would within a given time produce definite results."

Morrison (10) of Minnesota sent out a questionnaire to 342 deans of 32 State Universities, 14 privately endowed colleges and universities and 8 women's colleges to find out:

a. Whether any effort was being made by the universities to analyze the causes of students leaving college.

b. What proportion of the students had mental difficulties as undergraduates and graduates.

c. What was the attitude of educators toward the need of work in mental hygiene in the universities from both the instructor's and student's standpoint and how the problem of reaching and advising the students on this subject might be approached.

His results show that there seem to be many universities which have analyzed to some extent the causes of students leaving college, but little further is done about it. The proportion of students having difficulties of a mental nature was thought by most to be sufficient to warrant a careful study. There was a fairly general agreement that mental hygiene advice would help, but many different methods were suggested as to how the students could be brought into touch with such help, and who should be the one to give the help. Opinion was about equally divided on the question of required mental hygiene courses. Many mentioned the difficulty of securing persons of requisite training to do this work.

In his summary Dr. Morrison suggests several possible plans, viz.:

1. The employment of a neuro-psychiatrist on the staff of the University Health Service.
2. A complete physical and mental examination of every student once a year.
3. Instructional lectures on this subject to the faculty, both for their own good and so that they might earlier recognize danger signals in their students.
4. Faculty advisers of small groups of students.
5. Encouraging students to seek help from deans and instructors.

CONCLUSIONS AND SUMMARY

1. The scholastic, social and personal problems of college students are based on natural and understandable causes.

2. These problems are receiving inadequate attention.

3. These problems are present on every campus.

4. A beginning of handling these problems has been made by the psychological clinic.

5. Individual handling of these problems is a necessity because of the extremely personal nature of most of them. However,

6. Mental Hygiene classes would serve as a preventive measure, and might care for some of the less serious problems.

7. Little or no work is now being done in most universities, although the problem is being recognized, and the solution is only a matter of time, and publicity.

8. There is need of much additional study and experiment to determine:

a. Methods of organization.

b. Methods of securing cases.

c. Clinical syllabus for the examination of cases.

d. Suitable objective tests.

e. Routine procedure.

f. Methods of follow-up work.

g. Correlation with other campus agencies.

9. There is a need for educating the public to the appreciation of this new point of view toward a familiar problem.

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THE EFFECT OF ATTENDANCE AT CHINESE LANGUAGE SCHOOLS ON ABILITY WITH THE ENGLISH LANGUAGE

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PURPOSE

This study is an attempt to throw light on the foreign language school problem which is perplexing Hawaii. There is a definite sentiment among the leading thinkers in Hawaii that the schools conducted privately in Oriental languages are detrimental to Americanization and racial assimilation. This is one aspect of the broad wave of Americanization which was one of the results of the World War but is intensified by the persistent hostility of California to the Oriental on the western coast. Naturally, the sentiment against the foreign language schools in Hawaii, which has recently crystallized into regulating legislation, is founded on definite reasons. There are three of the reasons which are current: (1) The foreign language schools are unpatriotic, if not positively seditious, (2) the foreign language schools, coming as they do as an extra daily burden of confinement in school and of mental activity, are detrimental to the health of the boys and girls attending them, (3) the foreign language schools retard the children in the public schools and handicap them in their acquisition of the English language. The first argument is exceedingly difficult to substantiate with positive evidence. The second and third arguments are verifiable by evidence if trouble is taken to secure the facts. It is the purpose of this study to determine what influence, if any, attendance at a school conducted in an Oriental language has on the acquisition of and ability to use the English language.

The real opposition to these schools in Hawaii is directed against the Japanese language schools. The Chinese and Korean language schools pass almost unnoticed. This is for two reasons. First, and probably most important, the Japanese are suspected because of their imperialistic and militaristic tendencies as a race and there is fear that we may have, growing up in our midst, a people who have such sympathy toward their fatherland that in time of discord it might lead to definite allegiance with Japan. It is the fear of a hyphenated-American group who might, as the German-Americans during the war, play treacherous, which is the background of the real opposition to the Japanese language schools. There is no analogous fear of the Chinese and Korean language schools. But the second reason, which supports the first, is that the Japanese language schools so far outnumber the rest of the language schools. The figures from the inspector of Language Schools of the Department of Public Instruction for June 15, 1923, tell the story.

	PUPILS	TEACHERS	SCHOOLS
Japanese	18,920	325	137
Chinese	1,170	27	8
Korean	241	14	9
Russian	21	1	1
	20,352	367	155

Unfortunately, practically all the Japanese children attend schools in their own language (besides the public schools) so that it was impossible to study the effect of language school attendance on their English ability. After casting around it was discovered that not all the Chinese children attend schools in the Chinese language. In fact, the proportions of those who do and those who do not attend such schools are roughly equal. Accordingly, it was proposed to study a number of Chinese children who have attended schools conducted in the Chinese language and an equal number of those who have not attended such schools to see if there is any difference in their ability to treat with the English language. Since the real contention is over the Japanese language schools, it is unfortunate that this study could not have been made on them. The results of this study, however, ought to be applicable to schools conducted in any Oriental language. While Chinese and Japanese are not the same language, in fact, are as different as French and German, they resemble each other in certain respects, especially in their written symbols and probably are enough like each other and unlike English to make the results of this study apply to the Japanese situation. All that can be definitely claimed is that the results are true for the Chinese. They ought to give the careful thinker and shrewd observer material so that he may draw more correct conclusions than he otherwise might as to the influence of the Japanese schools.

METHOD

The most obvious way to attack this problem is to find what retardation there exists in the public school progress of those children who have attended Chinese language schools as compared with those Chinese children who have not attended these schools. If children who have attended Chinese language schools are older, grade for grade in the public schools, than those who have not attended Chinese language schools, and the intelligence of the two groups is the same, then we may attribute this retardation to factors in the environment among which would be the Chinese language schools. And since ability to progress in public schools is dependent on the ability to use and understand English language, such retardation would be evidence of a difference in their ability in English. Such retardation, if it exists, might well be due to differences in the home environment. Accordingly, if it is possible to eliminate the language influence of the home, what difference exists might properly be attributed to the Chinese language school, the only other powerful differentiative influence in the child's life.

But a more direct and more accurate method than that of studying the grade retardation is measuring the children with tests which deal with various phases of their English ability.

Such a method is more direct as it measures the English ability directly and does not depend on any hypothesis of progress in school waiting on English language ability. Such a method is more accurate because whereas 77 per cent of the children are measured by a reading test (Thorndike-McCall) within a year of their true reading ability, as pupils are usually graded (on the basis of the teacher's judgments and improvised examinations) only 56 per cent are in the grade which most nearly fits their ability.[1]

The following tests were selected to measure various phases of English ability:

Thorndike-McCall Reading Scale, Form 3.
Thorndike Test of Word Knowledge, Form A.
Kelley-Trabue Completion Exercise Alpha.
Charters' Diagnostic Language Test, Miscellaneous A, Form 1.

Besides these four tests Pintner's Non-Language Mental Tests were given. These tests are wholly independent of language even to the directions. The directions are given in the form of illustrative exercises on the blackboard. However, oral directions are also given. I doubt if this was the slightest advantage to any, as all the children are able to understand simple spoken English. Naturally, the tests depend on acquired experience, but it is experience that is shared by all groups alike and hence the test is a good measure of innate intelligence.[2] Non-verbal tests never have shown quite the

[1] Kelley found in the standardization of the Stanford Achievement Test that in four California school systems only 35 per cent of the children were in the grade which most nearly fitted their ability.

[2] In this connection it was suggested that children who have attended a Chinese language school would have an advantage in this Pintner Non-Verbal Test because of the similarity of the material to Chinese symbols, especially in tests 2 and 3. To check this I computed the performance of the two groups (those who have never attended and those who have attended Chinese language school) for tests 1, 4, 5 and 6, also tests 2 and 3, and obtained the correlation between test performance and having attended Chinese language school (bi-serial r). The correlation between tests 1–4–5–6 and having attended Chinese Language School is +0.225. The correlation between test 2–3 and having attended Chinese

validity that verbal tests have shown. The writer takes it that this is because it is more difficult to devise non-verbal tests which make the same demands on thought that verbal tests do. But since we are using these tests to determine average performance on large groups, they ought to show average levels of innate ability as accurately as could be desired.

These tests were given to Chinese children in two elementary schools in Honolulu which I shall call schools A and B. The tests were given about a week apart in March, 1923. A morning was used to give all the tests in a given school but the order in different rooms was different. The tests were given by six of my students in Education, my wife and myself, and the conditions under which they were given were very satisfactory.

WHAT THE AGE GRADE FIGURES SHOW

When the sheets were sorted into the three piles which showed the number who have or have not attended Chinese language school, they made groups of the following sizes.

	YEARS OF ATTENDANCE AT CHINESE LANGUAGE SCHOOL			
	Never	0 to 2	2–	Total
Public school A	87	52	141	280
Public school B	71	52	110	233
Total	158	104	251	513

language school is +0.225 (by chance, just the same). The scores on 2–3 were jammed at the top of the test and hence before the bi-serial formula could be used a correction for σ had to be made using formula 188 on p. 227 of Kelley's "Statistical Methods." The careful reader will note later that the total Pintner Non-Verbal Test correlates with attendance at Chinese language school +0.282. I attribute this to the fact that since no correction has been made in tests 2 and 3 for jamming at the top, the σ in the bi-serial r formula is too small.

The conclusion of this is that the Pintner Non-Verbal Test is a valid test by which to compare the intelligence of our two groups. I wish to stress here the fact that there is no appreciable transfer even in the case of material which so closely resembles Chinese symbols.

The statistical age constants by grade are:

YEARS ATTENDANCE LANGUAGE SCHOOL	GRADE				
	IV	V	VI	VII	VIII
			Mean age in years		
0	11.36	12.36	13.35	14.30	15.10
0–2	10.96	12.00	13.32	14.43	15.20
2–	11.21	12.03	13.26	14.50	15.52
			σ		
0	1.40	1.25	1.41	1.15	1.02
2–	1.13	1.28	1.24	1.27	1.18
			σ_M		
0	0.28	0.27	0.27	0.31	0.27
2–	0.14	0.17	0.18	0.21	0.18

To determine whether the differences in age in a given grade between those who had never attended Chinese language school and those who had attended two years or more were significant the σ's of the differences were obtained, using the formula:

$$\sigma_d = \sqrt{\sigma_1^2 + \sigma_2^2}$$

	GRADE				
	IV	V	VI	VII	VIII
σ_d	0.31	0.32	0.32	0.37	0.32
$\frac{d}{\sigma_d}$	0.48	1.03	0.28	0.38	1.31

and the probability that such a difference is a real difference and not a difference dependent on chance is very low.

The correlation between age and having attended language school using bi-serial

$$r = \frac{M_2 - M_1}{\sigma} \times \frac{pq}{Z}$$

$$\sigma_r = \frac{\left(\frac{\sqrt{pq}}{Z} - r^2\right)}{\sqrt{N}}$$

	GRADE				
	IV	V	VI	VII	VIII
r	−0.11	−0.16	−0.03	−0.06	−0.18
σ_r	±0.10	±0.11	±0.13	±0.17	±0.23

This tells the same story as the former—that the numbers are too few to give a significant relationship between grade retardation and attendance at language school.

Thinking that perhaps a *summation* of differences in grade retardation might yield a significant result I tried the following. Slipping the distribution of the 5th grade down one year (as though the whole grade had never been promoted from the fourth grade), slipping the distribution of the sixth down two years, etc., I summed the distributions across and found the difference in means of these total distributions. This is the equivalent of finding a weighted average of the separate grade differences.

Calling the mean of the group that had never attended language school as par, the group that has attended 0 to 2 years is 0.24 of a year younger per grade and the group that had attended 2 or more years is 0.14 of a year younger per grade, where the σ of this last difference is 0.08. Here again we find no significant difference. On the basis of these figures it seems that the Chinese foreign language schools do not have a retarding influence which is appreciable with the number of children used in this study.

WHAT THE TESTS SHOW

The method of correlation was used to interpret the test results. Bi-serial r was used in the correlations with attendance at language school. Chronological age and intelligence (non-verbal) was eliminated by partial correlation.

For convenience, let the following numbers symbolize the units used:

	M	σ
	years	
0. Grade		
1. Age	12.9	2.00
2. Pintner-Non-Verbal	32.2	93.25
3. Thorndike-McCall Reading	20.4	5.57
4. Thorndike Word Knowledge	37.5	17.3
5. Kelley-Trabue Completion	5.37	1.32
6. Charters Language	13.6	7.23
7. Attendance at Language School		

Correlations

(Numbers in parenthesis are σ_r)

	1	2	3	4	5	6	7
0	+0.751 (0.109)	+0.385 (0.037)	+0.747 (0.019)	+0.769 (0.019)	+0.601 (0.028)	+0.697 (0.023)	+0.109 (0.058)
1		+0.380 (0.037)	+0.507 (0.033)	+0.555 (0.031)	+0.451 (0.035)	+0.491 (0.034)	+0.048 (0.058)
2			+0.480 (0.034)	+0.430 (0.036)	+0.398 (0.037)	+0.376 (0.038)	+0.282 (0.054)
3				+0.769 (0.019)	+0.711 (0.022)	+0.741 (0.019)	+0.074 (0.058)
4					+0.684 (0.023)	+0.754 (0.019)	+0.047 (0.058)
5						+0.698 (0.023)	+0.009 (0.058)
6							+0.107 (0.058)

The four first order correlations show that there is practically no relationship between having attended a Chinese language school and ability with the English language. The correlation $r_{27.1}$ = +0.286 (0.054) shows that there is a significant positive relationship between intelligence and attendance at a Chinese language school.

Four first order correlations

	r	σ_r	
$r_{37.1}$	+0.058	(0.058)	The formula used to compute the σ_r is that for bi-serial r
$r_{47.1}$	+0.024	(0.058)	
$r_{57.1}$	−0.015	(0.058)	
$r_{67.1}$	+0.096	(0.058)	

Second order coefficients

	r	σ_r	
$r_{37.12}$	−0.052	(0.058)	The formula used to compute σ_r is that for bi-serial r
$r_{47.12}$	−0.002	(0.058)	
$r_{57.12}$	−0.101	(0.058)	
$r_{67.12}$	+0.032	(0.058)	

This gives us the correlation between the various language functions and attendance at Chinese language schools with age and intelligence rendered constant.

	READING	VOCABULARY	COMPLETIONS	LANGUAGE
$\frac{r}{\sigma_r}$	0.90	1.07	1.74	0.55

None of these is significant. The language school has apparent slight retarding effect in the different functions, but the numbers used in this study were not large enough to make this certain. Note that the language test shows a positive (although inconclusive) correlation with attendance at language school.

If we take the average of the four correlations (−0.045) and multiply the population by 4 making $\sigma_r = 0.029 \frac{r}{\sigma_r} = 1.55$ giving only a low probability (16 to 1) that there is a retarding influence coming from the Chinese language school.

Our final problem is to locate the cause of this retardation in English ability. Such retardation must occur where these children who are retarded are handicapped in their English ability. These places may be (1) of the Chinese language school, (2) the home. I can think of no other place where those children who do not attend language school are going to have any extra advantage in acquiring English. Certainly the public school, playground, street or moving picture house is not going to discriminate between children who have and children who have not attended Chinese language school.

The following tabulation shows which language is commonly reported in the homes of these children:

Language spoken in the home

YEARS OF ATTENDANCE AT CHINESE LANGUAGE SCHOOLS	CHINESE	BOTH LANGUAGES OR DOUBTFUL, OR UNKNOWN	ENGLISH	TOTALS
0	132 (84%)	16 (10%)	10 (0%)	158
0–2	73 (75%)	16 (35%)	10 (10%)	104
2–	204 (81%)	32 (13%)	15 (5%)	251
	414	04	35	513

There is no difference in the relative amounts of Chinese and English spoken in the home for the different groups as reported by the children. I must conclude therefore that the retardation of about five months for a twelve year old child in ability in English is caused by attendance at the Chinese language school.

INFLUENCE OF THE LANGUAGE IN THE HOME

It was shown earlier that there was no correlation between attending foreign language school and speaking English in the home. Several interesting things come out of a study of the 35 children who say they come from English speaking homes.

	CHILDREN FROM ENGLISH SPEAKING HOMES	ALL CHINESE CHILDREN
I.Q.	99.4	90.3
R.Q.	86.3	88.3
V.Q.	98.8	95 4
C.Q.	83.3	85.2
L,Q.	88.2	90.9
R.R.	86.9	88.8
V.R.	99.5	90.0
C.R.	84.4	85.7
L.R.	88.7	91.5

The numbers are too small to make any differences significant. It is evident that the children are of about the same brightness as those who come from Chinese speaking homes and are not at all superior in their English ability to those children. Note that they excel in vocabulary and are inferior in their recognition of language errors. Putting this last with the small positive correlation found between attendance at language school and language leads me to surmise that there is something of significance here. Those children who learn their English at school learn better English than when they learn poor English at home. The imperfect English which the home furnishes results in poorer language habits as far as grammatical correctness goes than when they hear no English at home. Correct speech has a worse enemy in the Pidgin English of the home than in the Chinese language school. On the other hand, English in the home results in a larger English vocabulary than when the conversation and thought is in Chinese. Here again the Chinese language school works to prevent the growth of the vocabulary by requiring expression and thinking in Chinese. I estimate that the influence of the home and playground is about four times as great as the Chinese language school in causing retardation in the English language.

PRACTICAL CONCLUSIONS

The first conclusion to be drawn is the fact that differences among individuals far exceed differences caused by any one social agency—far exceed differences caused by attendance at a Chinese language school. The distribution of I.Q.'s shows this plainly. I hope that those who are interested in education in Hawaii will consider this fact seriously. We have been afraid of the influence of the foreign language school and yet the influence of the foreign language school is only about one-fiftieth of that influence that gives one twelve-year-old child the ability of the average child of nine and another twelve-year old child the ability of the average youth of fifteen. What is this factor which produces these really remarkable differences? Home conditions may account for part of these differences, but heredity is also a large factor. If we are really interested in the English of the children and the kind of English they will speak as adults we had better let the foreign language school alone and turn our attention to the home, the playground, and to the kind of individuals who are born. Of course, these factors are practically impossible to influence, but that shows us that the language situation cannot be changed overnight. The public schools on the islands are doing a heroic and effective work along this line.

The second conclusion is that the effect of the Chinese language school on the English ability of its students is so small as to be negligible. If I am not mistaken, it is the gross correlation of attendance at foreign language school and ability in English that is the bone of contention. As we have seen that is negligible, but, if anything, is positive. Taking Chinese children as you find time they are not noticeably retarded in English because of attending foreign language schools. Chinese children who attend Chinese language schools are neither younger nor older in their grades than those who have not attended Chinese language school.

I take it that the real retardation of the children who attend Chinese language school because of their superior intelligence does not enter into the controversy. People, in general, do not care whether children are achieving what their ability warrants so long as they keep up with their school mates. But to the educator and to the psychologist these children who attend Chinese language school are probably slightly retarded from what they would have achieved if they had not attended the foreign language school. Since this small retardation cannot be due to home condition, we must ascribe it to the foreign language school as the only differentiating factor. This retardation is practically nil in language habits. The retardation shows itself in their stock of English words and in their ability to use these English words to express their thoughts.

AN ANALYSIS OF SEVERAL WELL-KNOWN TESTS

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This paper is an attempt to analyze, through the technique of partial correlation, two well known cancellation tests—the A-test and the a-t test—and the equally well known Color Naming test. Whipple in his "Manual of Mental and Physical Tests" says in the introduction[1] that "What we need is not new tests, though they are welcome enough, but an exhaustive investigation of a selected group of tests that have already been proposed." And even a superficial examination of the literature of tests will convince one that very often indeed, workers with tests have used them with no clear understanding of what the tests measure, or—what is worse—with the idea that a test actually measures say, attention, or perception, or reasoning, because it is so labeled. Indications that even if we do not know exactly what a test measures, at least we realize it, are seen in the tendency of present-day workers to call a test by some descriptive title rather than in terms of some more or less vaguely defined mental function which it may be thought of as measuring; and so we have cancellation tests, opposites tests, completion tests, etc., instead of tests of perception, association, or reasoning.

It seems to the writers that the next step is to separate out, so far as this can be done, the various factors which make for efficiency of performance in a given test. The better these factors can be identified, the better able we are to say what our test measures. Rosenow[2] has shown in a very complete fashion how the method of partial correlation may be used in analyzing mental tests and the purpose of this paper is to show how the method may be employed to find some, at least, of the factors which condition the performance of tests, which, though generally considered simple, are often very differently interpreted.

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[1] Manual of Mental and Physical Tests, Simpler Processes, 1914, p. 4.

[2] The Analysis of Mental Functions, Psych. Mono., 1917, vol. xxiv, no. 106.

I. CANCELLATION TESTS

Though generally admitted to be among the simplest tests that we have, tests of cancellation have presumably measured different functions for different investigators. Generally,[3] such tests have been known as tests of "discrimination" or "attention"; with variations, they have been called tests of "speed of perception," "efficiency of perception," "speed and accuracy of perceptual discrimination," "time of discrimination, association, and movement." More specific information can be got by studying the correlations of cancellation tests with other tests. Cancellation correlates uniformly low with tests of general intelligence, and very seldom higher (and often much lower) than 0.40 with such tests as analogies, word-building, completion etc. While these correlations tell us something about cancelling ability, they leave much to be desired in the way of positive information.

If we look at cancellation from the standpoint of one taking the test, it would seem that we are able to discover at least two factors upon which efficiency in the tests depends. First, there is certainly present the factor of perception or recognition of the symbol or symbols to be marked; and secondly there is always present the factor of motor movement—the simple crossing out of the symbol after we have found it. Vogt[4] has attempted to separate out the motor movement factor by comparing the amount covered in cancellation of the usual kind, and the amount covered when the symbols are simply recognized but not marked. He reported that the marking movement accounted for from 15 to 40 per cent of the time required depending on the practise of the subject. This method would seem to be the logical way of getting at the marking factor; provided the test, except for the absence of marking, remains in all other respects the same. That this is not true, however, anyone taking the test can easily discover for himself. Interferences, difficulty in holding the place, or marking progress, arise to make the test a *new* test, and not simply cancellation minus the marking movement. It was to avoid this "fallacy of subtraction" that partial correlation was used as a means of analysis.

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[3] Whipple, Manual of Mental and Physical Tests, Simpler Processes, p. 305 ff.

[4] Whipple, *Manual of Mental and Physical Tests*, Simpler Processes, p. 320.

We began with the idea of finding tests which would measure the two factors, (1) movement involved in marking, and (2) simple recognition involved in finding the symbol to be cancelled. With this end in view, we gave the A-test and the a-t test to a class of 54 undergraduates in Columbia College. The task in the first test is to mark out every A (there are 100 A's) in a paragraph of pied capital letters. In the second test, the subject is required to mark out every word which contains both an *a* and a *t* from a page of Spanish text. Following these, several other tests were given:

1. A test of Rapid Motor Coördination. This test, devised and named by C. K. Taylor, requires the drawing of four short vertical lines crossed by a horizontal line (in the form of a "gate"). The measure of performance used by us was the time taken to make 100 little "gates" on a sheet ruled in ten columns and ten rows. This test is a measure of simple motor activity, and compares with other tests of movement such as making dots, dealing cards, etc.[5] It seemed to us that this test should measure, with a minimum of other factors involved, the simple marking employed in cancellation.

2. A test of Rapid Recognition. (Also devised and named by Taylor.) In this test, the subject is given a page of jumbled numbers running from 1 to 50, which he is to join by straight lines, going from each number to the one which follows it directly.

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[5] Franz, Handbook of Mental Examination Methods, 1919.

3. *A test of more complex recognition.* In this test the task was to locate and mark all of the three-letter words found in a paragraph of unspaced and pied material; and directly afterwards to locate and mark all of the four-letter words in a second paragraph. There were twenty-four words in each paragraph. The total time taken on the two paragraphs was recorded and a correction added for each word omitted. Three months after the first giving of this test, it was repeated on the same group, this time with the marking movement omitted. The students were instructed to note each word but not to mark it, and as a check were required to write down the number of words found at the end of the test.

TABLE 1

(All records are in seconds)

	TESTS:					
	A-test	a-t test	R.M.C.	Rapid recognition (not used)	Recognition of words with marking	Recognition of words without marking (not used)
Average........................	101.28	209.48	122.82	239.72	179.37	314.59
SD.............................	20.07	48.02	14.40	65.20	36.07	67.48

The averages and the SD's for each of these tests are given in table 1. The average of 101.28 seconds on the A-test is closely in line with the results of Whitley[6] and other investigators who have used this test with college students. In table 2 are given the correlations of the A-test and the a-t test with each of the other tests. None of the correlations are very high (though all are positive), the correlation of the A and the a-t tests—e.g. 0.62—being the highest. Apparently none of our tests overlap very completely either of the two cancellation tests, though the recognition of words seems to be more closely related to the cancellation tests than the rapid motor test.

[6] *Tests for Individual Differences*, Archives of Psych., no. 19, 1911.

The next step was to work out a regression equation which would give the relative importance in cancellation of the marking movement factor and the recognition factor. It seemed to us fair to take the test of Rapid Motor Coördination (known hereafter as r.m.c.) as representative of the marking activity which is present in cancellation, but in selecting a test which would represent the recognition element, the task was not so easy. The so-called Rapid Recognition test was first discarded because it did not seem to be exactly the same sort of recognition which we find in cancelling, and further because it is complicated by the drawing of lines, and hence, to some degree at least, is dependent on movement. It would look as though the Recognition of Words, without marking, would be the best test of the recognition of certain symbols, minus the marking movement. Further consideration, however, caused us to decide against this form of the test in favor of the test, as first given, in which the subject was required to mark the words when found. In the first place, the marking of the words, as reported by the subjects and checked by observations of the experimenter, served rather as a means of keeping the place

TABLE 2

	A-TEST	a-t TEST	R.M.C.	RAPID RECOGNITION	RECOGNITION OF WORDS WITH MARKING	RECOGNITION OF WORDS WITHOUT MARKING
A-test		0 62	0.37	0.01	0.43	0 02
a-t test	0.62		0.22	0.38	0.53	0.38
R.M.C.	0.37	0.22		0.31	0 16	0 18
Rapid Recognition	0.01	0.38	0.31		0.27	*
Recognition of Words with marking	0.43	0.53	0.10	0.27		0 42
Recognition of Words without marking	0 02	0.38	0.18	*	0.42	

* No correlations found.

than as a distraction or as a kind of motor movement. That it actually facilitated recognition is shown by the fact that the total time taken to mark a blank was, on the average, nearly twice as great for the test without marking as for the test with marking; and further by the evident difficulty which the men had in keeping the place when no marks were made. Several students used their finger or followed the lines with a pencil in order to keep track of the words as they were recognized. All reported that the test was far less difficult when the marking was permitted. The relatively small part which speed of marking, and the relatively great part which ability to find the words in the complex material, play in determining one's score seemed to recommend this test as a fair measure of that recognition, whose influence in cancellation we wished to find. From the statistical standpoint we believed that the two tests selected, r.m.c., and Recognition of Words were satisfactory, in that they are highly enough correlated with the two cancellation tests to indicate the presence of common factors, and yet they are not so highly related to them as to be merely measures of the same function.

The first regression equation was worked out from the following variables:

1. A-test.
2. Rapid Motor Coördination test.
3. Recognition of Words (with marking).

The partials and the regression equation are given below:

r 12.3:0.34 r 13.2:0.40 r 23.1:0.00

$_1$ (A-test) = .31x_2 (Rapid Motor Coördination) + 0.38x_3 (Recognition of Words)

In this equation the SD's of all of the distributions have been taken equal[7] in order to show the relative contribution of the two tests to the A-test, irrespective of the unit of measurement used in either test. The regression equation shows that the two factors are nearly of equal importance. We are able to say, therefore, that any given score on the A-test is contributed to equally by the marking-movement and the recognition of the symbols, in so far as these factors enter into the A-test. Presumably, many other factors are present and unaccounted for by the two tests above. Several facts should be considered in the light of these conclusions.

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[7] T. L. Kelley, Bulletin University of Texas, 1916, 27, p. 8.

1. The raw correlation between the A-test (1) and r.m.c. (2), e.g., r12 = 0.37, is only slightly affected by ruling out the Recognition of Words test (3), e.g., r12.3 = 0.34. The raw correlation between the A-test and the Recognition test, e.g., r13 = 0.43, is also only slightly affected by ruling out r.m.c., e.g., r13.2 = 0.40. This would indicate that both (2) and (3) actually do measure something which is present in the cancelling test independently of each other, while their partial correlation, r23.1 = 0.00, would indicate that they measure different aspects or phases of the total process.

2. The relative importance of the two factors as we have given them holds only for rapid marking and recognition as defined by our tests. The multiple correlation coefficient $R_{1(23)} = 0.52$ serves to dissipate any delusions that we may have that we have measured *everything* that there is in the A-test. In so far as our tests do measure speed of marking and ability to find certain designated symbols, however, it seems reasonable to conclude that these two factors play an equal rôle in determining the score on the A-test.

3. To one who has taken or given the A-test many times, we do not believe that it will seem exceptional that the marking movement should be so important. The finding of the A's is a simple sort of recognition, done with little hesitation or search except the first time the test is performed. Increase of speed with practise would then (to hazard a guess) be due to the increasing mechanization of the "finding process" and the consequent changing of the test into a simple marking exercise. Our equation holds only for the *first* performance; as practise goes on, the relative weight of the two factors would probably shift, the marking becoming more important, and the recognition less important.

The procedure which we followed with the A-test was repeated with the a-t test. The three variables are

1. a-t test.
2. Rapid motor coördination test.
3. Recognition of words (with marking.)

The partial correlations and the regression equation are as follows:

$$r\ 12.3 = 0.17 \qquad r\ 13.2 = 0.51 \qquad r\ 23.1 = 0.05$$

$$x_1 \text{ (a-t test)} = 0.15x_2 \text{ (r.m.c.)} + 0.50x_3 \text{ (Recognition of Words)}$$

The SD's have been taken as equal for the reasons given previously. This equation indicates that the two factors are differently related in the a-t test than in the A-test. In a-t, recognition accounts for three times as much of the score as the marking movement. This result is certainly in line with common sense experience with the test. Finding the words to be cancelled in the a-t test is much more difficult than finding the A's to be marked in the A-test. The low raw correlation of a-t and r.m.c. and the slightly lower partial correlation with recognition out, gives little weight to the simple marking factor; while the practically zero correlation of r.m.c. and recognition with a-t out, r23.1 = 0.05 is consistent with the results found for the A-test, and serves to substantiate our earlier statement that the two tests are independent. On the other hand, ruling out the effect of r.m.c. (r13 = 0.53 and r13.2 = 0.51,) has a negligible effect on the correlation of a-t and recognition. Evidently, ability to find the words containing *a* and *t* is much more important in determining one's score than the ability to mark the word when found. The multiple coefficient $R_{1(23)} = 0.55$ shows that there are other factors involved in the a-t test than those we have found; chance errors, interferences, slips of attention, etc. are probably some of these.

The score on the a-t test is influenced then in the ratio 3:1 by the tests of recognition and the marking movement. It is highly important that the word *score* be included in this statement. If we were able to say that Cancelling Ability is made up in a certain way of the two factors, recognition and marking movement, we could then say that the score on a cancellation test should be influenced in exactly the same way by the two factors. It would, however, be disastrous if we argued in the reverse direction; from test to hypothetical ability.

II. THE COLOR NAMING TEST

One of the most striking features of the Color Naming test is the inhibition or interference which the subject experiences during its performance. He starts out confidently, naming the colors rapidly, but before he has gone very far he begins to hesitate and make mistakes; sometimes he will even stare at a color for several seconds before he can give its name. There are great individual differences in the amount of interference experienced; some subjects feel practically none, some experience a little, but by making an effort overcome it, while others are bothered throughout the entire performance. Interference was therefore selected as one of the factors to be studied for its effect on Color Naming.

Next the Color Naming test certainly involves perception of the colors—or probably recognition of the colors—and it seems reasonable to assume that individual differences in speed of recognition would influence performance on the test.

Finally, it is possible that an individual's performance might be influenced to some extent by the speed with which he is able to speak the names of the colors.

The three factors chosen for investigating color naming were, therefore,

1. Interference or inhibition.
2. Speed of recognition.
3. Speed of speech.

1. Interference

A test which would measure the interference factor directly would be very difficult, if not impossible, to devise. This factor could, however, presumably, be measured indirectly by a test identical with the Color Naming test in all particulars except the interference-causing feature. This feature, according to Wordworth and Wells,[8] is very likely the equal readiness of all five colors from immediately preceding use. A test involving 100 *different* colors, all just as familiar to the subject as the five used in the standard test, would probably be free from interference; hence a measure or index of the amount of interference experienced could be obtained by comparing the time for the standard test with the time for the 100-color test. As this sort of test was obviously impossible, it was thought that the next best thing would be to have the subject perform the standard Color Naming test in a modified manner, naming all of the squares of a given color in succession, instead of in a mixed order. That is, he would start with the first color, say Red, and sweep his eyes across each line from left to right, calling out Red each time he perceived a red square. Immediately upon saying the last Red, he would go back to the beginning and name all of the Blacks, followed in turn by the Yellows, Greens, Blues, using the first five colors of the top line as a guide to the order. The subjects experienced practically no interference in this test, which is referred to hereafter as the Color Finding test. The "interference index" of the subject was then taken to be the ratio of his time on the Color Naming test, standard method, to his time on the Color Finding test. Although this index is a ratio of two scores, and not a directly measured quantity, it is believed that it does give information concerning the amount of inhibition experienced by the subject, which cannot be obtained from either of the component scores alone. It is therefore to to be expected that an individual showing signs of considerable interference in the Color Naming test would give a high interference index, and vice versa. Incidental observation showed that this was usually the case. It is evident, however, that the "interference index" may not depend entirely on the interference in color naming, but may also be influenced to some extent by ability in the particular "hunt and find" type of activity which is characteristic of the Color Finding test. The effect of this factor can, however, be cared for by statistical treatment.

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[8] Association Tests, Psych. Mono., 1911, no. 57.

2. *Speed of recognition*

"Speed of recognition" is a rather indefinite term, and it is probable that most individuals are not equally proficient in all types of "recognition activity." Recognition of colors is, however, the most important type from the standpoint of this study, and it was believed that the Color Finding test described above would serve as a good measure of such ability. For purposes of comparison it was decided to use also two "perception tests" of the conventional type; these were the a-t test and the word recognition test, previously described under cancellation.

3. *Speed of speech*

A test which would measure speed of speech without being influenced by speed of recognition might for example require the subject to recite, at maximum speed, some material which he had thoroughly memorized. Another type might require the subject to read material so easy and familiar that perception could take place much faster than speech could follow. Recitation of the alphabet is a good example of the first type. When this was tried, two defects at once became apparent. The performance took so little time that in order to obtain a reasonable range of scores it was necessary to use a multiple performance, which introduced a possibility of errors in counting the repetitions. Also, the subjects tended to mumble and slur the letters in spite of instructions to enunciate clearly. A second test considered was the reading of very simple prose. It was felt, however, that this would test a smooth, flowing type of enunciation rather than the more disconnected type used in saying the colors. The test finally decided upon was the reading of a series of two-digit numbers. The numbers were those of the Woodworth-Wells Constant Increment test, but instead of being arranged in columns, as in that test, they were typewritten in ten horizontal rows of ten numbers each following the spacing of the squares in the Color Naming test. All of the subjects reported that they could perceive the numbers much faster than they could say them; that is, the limiting factor was ability to enunciate rapidly rather than to perceive rapidly.

The tests were given as individual tests to 50 subjects, 25 men and 25 women. Nearly all of the subjects were graduate students in psychology. With the Color Naming, Color Finding, and Reading Numbers tests a double performance was taken in order to increase the range of scores. A stop watch, reading to $\frac{1}{5}$ second, was used for recording the time of performance.

The averages and the standard deviations of the various tests are given in table 3. All of the scores are in seconds except that for interference index, which is a pure number.

The most important correlations between the tests were calculated by the Product-Moment formula and are given in table 4. Since the Color Finding, Recognition, and a-t tests all correlate to approximately the same extent with the Color Naming, it was decided to use only the Color Finding test as a measure of the speed of recognition. The partial correlation coefficients are to be found in table 5. These are arranged to show the effect upon the raw correlation between Color Naming and each of the other tests, of the elimination of the effect of the other tests taken separately and jointly.

TABLE 3

TESTS	AVERAGES	SD
1. Color Naming	118.6	22.1
2. Interference Index	1.206	0.229
3. Color Finding	99.6	13.7
4. Reading Numbers	105.9	16.5
5. Recognition of Words	298.0	90.6
6. a-t test	181.8	38.1

The figures in the first column may be taken to mean that the correlation between Color Naming and Interference Index is very probably genuine and high; ruling out the Color Finding serves only to boost the correlation, from 0.71 to 0.85. Speed of speech (the Reading Numbers test) is practically without effect upon the correlation between Color Naming and Interference Index. since the correlation of no. 1 and no. 2 is not effected when no. 4 is "partialled" out. Going to the second column, it is seen that the correlation between Color Naming and Color Finding is nearly doubled when the Interference Index is ruled out. This may be taken as lending support to the

TABLE 4

Showing the intercorrelations between the different tests

	COLOR NAMING 1	INTERFERENCE INDEX 2	COLOR FINDING 3	READING NUMBERS 4	RECOGNITION OF WORDS 5	a-t TEST 6
1. Color Naming	–	0.71	0.37	0.19	0.26	0.36
2. Interference Index	0.71	–	−0.18	−0.04		−0.04
3. Color Finding	0.37	−0.18	–	0.29		0.53
4. Reading Numbers	0.19	−0.04	0.29			
5. Recognition of Words	0.26					0.67
6. a-t test	0.36	−0.04	0.53		0.67	

		PE			PE			PE
r_{12}	0.71	0.05	r23	−0.18	0.09	r34	0.29	0.08
r_{13}	0.37	0.08	r24	−0.04	0.10	r36	0.53	0.07
r_{14}	0.19	0.09	r26	−0.04	0.10			
r_{15}	0.26	0.09				r56	0.67	0.05
r_{16}	0.36	0.08						

TABLE 5

1. Color Naming
2. Interference Index
3. Color Finding
4. Reading Numbers

r_{12}	0.71	r_{13}	0.37	r_{14}	0.19
$r_{12.3}$	0.85	$r_{13.2}$	0.72	$r_{14.2}$	0.31
$r_{12.4}$	0.73	$r_{13.4}$	0.34	$r_{14.3}$	0.09
$r_{12.34}$	0.85	$r_{13.24}$	0.69	$r_{14.23}$	0.16

$R_{1(234)}$: 0.88; PE: 0.02.

supposition previously made, that the main difference between the Color Finding and the Color Naming tests lies in the presence of the Interference factor in the second test, and its absence in the first. Again speed of speech, no. 4, has little effect. The coefficients in the third column are of little significance; they are all small and unreliable.

The multiple correlation coefficient $R_{1(234)}$, or the maximum correlation which we can obtain between test 1, Color Naming, and the combined effects of the other three tests taken together, is found to be 0.88. Some would interpret this coefficient as meaning that the chances are about 9 in 10 that any particular score on Color Naming depends on the scores in the three tests described. As the value which this multiple coefficient might be expected to have by a chance combination of our variables is 0.25 the obtained coefficient 0.88 is, therefore, probably reliable.

The regression equation, which expresses Color Naming (1) in terms of the other three variables (2), (3), (4), is given below. The coefficients have all been multiplied by a convenient constant in order to make their sum equal to 100, and thus show more clearly the relative weight of the three tests in determining the score on Color Naming. x_1 (Color Naming = $0.58x_2$ (Interference Index) + $0.36x_3$ (Color Finding) + $0.06x_4$ (Reading Numbers).

It is clearly evident from this equation that the Interference Index is of greatest importance in the Color Naming score; speed of color recognition ranks next, while speed of speech evidently plays a minor part.

In view of the importance of interference, the cause of this state of things becomes a matter of much interest. Warner Brown[9] has reported an experiment in which a comparison was made of the time required to name a series of colors (not those of the standard test) and the time required to read the same color names when typewritten on a sheet. He found that the names could be read in approximately half the time required to name the colors. Both performances were improved by practise, the per cent of improvement being about the same in each. This experiment was tried, in an abbreviated form, in the present study—the standard Color Naming test being used,—and the additional fact was noted that practically no interference occurred when reading the color names from the typewritten sheet, in spite of the fact that the factors of recency and frequency affect all of the color names to the same extent as in the Color Naming test. Hence it seems reasonable to say that interferences which arise in naming colors are due not so much to an equal readiness of the color names as to an equal readiness of the color recognitive processes. Another factor present in interference is very probably the present strength of the associations between colors and their names, already determined by past use. Practise usually reduces interference in this test, though oftentimes the improvement is slight.

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[9] Psychological Review, 1915, vol. 22, p. 45.

THE RELATIONSHIPS BETWEEN THREE TESTS OF IMAGINATION; AND THEIR CORRELATION WITH INTELLIGENCE

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There are numerous practical situations in which imagination, in the sense of ability to reorganize the data of past experience, plays an important part. It is often difficult, of course, to distinguish between imagination, so described, and thinking. Imagination, however, is taken to involve a reorganization which does not have, definitely, to represent past experience, nor to present a pattern necessarily true in any future sense. Productive imagination and invention, which are considered as functions of intelligence, do characteristically present regroupings of data which are valuable in future action. Diagnostic indications of such ability, or tests which purport to be such, are worth examining.

There are three tests of imagination, two of them rather commonly used, which are supposed to measure active and productive imagining ability. These are the ink-blot, word-building and linguistic invention tests. The purpose of this paper is to present the results of an investigation into the relationships which obtain between these three tests—as to whether or not they seem to measure the same type of ability—and into the correlation between these tests and intelligence as measured by Army Alpha.

Each imagination test was administered according to the standard methods, cited by Whipple.[1] Ink-blots 1–10 of the series furnished by C. H. Stoelting Co. were used, five minutes being given each subject in which to write down the objects which he could make out of each lot. For the word-building, the set of letters *aeobmt* and *eairlp* were used, and the subjects were given five minutes for each. In the linguistic invention test, three sets each of nouns and verbs were used, as follows: *Nouns* (1) citizen, horse, decree; (2) bell, ground, owner; (3) skill, modification, picture; *Verbs* (1) bless, destroy, write; (2) make, correspond, remain; (3) require, choose, run.

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[1] Whipple, G. M., Manual of Mental and Physical Tests, Baltimore, Warwick and York, 1914.

The ink-blots were scored in terms of the average number of associations given to the ten blots; the word-building in number of words constructed out of the two sets of letters; and the linguistic invention in terms of the average number of sentences written for the six sets of words. This gives a quantitative score for each test. It was evident, however, that the quantitative score frequently failed to give a complete picture of the work done in the ink-blot and linguistic invention tests. A subject might see few objects in an ink-blot, but these objects might be complex and richly described; or one might build few sentences around the given words, but the sentences might be involved and well organized. Conversely, one might give many associations to the ink-blots, or write many sentences, but these might be conventional, barren or lacking in organization. Various rating methods were tried and discarded as of doubtful validity. Both ink-blot associations and sentences are too varied and numerous to be brought within a single rating. Finally a suggestion, made by Whipple[1] regarding Miss Sharp's qualitative scoring of sentences in the linguistic invention test, was followed. He says: "In practice, this scoring is virtually equivalent to estimating quality of work in terms of average number of words per sentence, and that simpler method may be used for the qualitative score." Accordingly, the words used in expressing the ink-blot associations, and in the sentences written, were counted—omitting definite and indefinite articles and counting all verb forms as one word.[2] This is admittedly a rough method, but it seems to give at least an approximately qualitative score.

[1] The writer is indebted to Mr. E. J. Birk for both the quantitative and qualitative scoring.

The subjects taking these tests were all students in general psychology at Washington University. It was impossible to secure a score on each test for all the subjects involved, but roughly 100 cases are represented in each correlation for each sex. The number of cases represented can be read approximately from the P.E.'s of the coefficients of correlation.

The following table will give some idea of the way in which the cases were distributed. Since to give the frequency distribution of each set of scores would be needlessly ponderous, only the means and standard deviations are shown.

	INK-BLOTS		LINGUISTIC INVENTION		WORD BUILDING	ARMY ALPHA
	Quantity	Quality	Quantity	Quality		
Men:						
Mean	7.05	23.80	7.49	80.10	45.00	151.27
S.D.	2.88	10.00	1.82	10.90	7.35	20.22
Women:						
Mean	7.20	25.05	7.45	02.20	39.77	142.06
S.D.	2.93	12.05	1.45	10.88	6.53	20.14

The intercorrelations have been made for each sex separately and are as follows:

	MEN	WOMEN
Acobmt with eairlp	0.580 ± 0.037	0.623 ± 0.036
Word-building with linguistic invention:		
Quantity	−0.061 ± 0.063	0.083 ± 0.060
Quality	0.092 ± 0.063	0.186 ± 0.066
Word-building with ink-blots:		
Quantity	0.152 ± 0.067	0.256 ± 0.065
Quality	0.170 ± 0.067	0.237 ± 0.060
Ink-blots with linguistic invention:		
I.B. *quantity*—L.I. *quantity*	0.031 ± 0.061	0.109 ± 0.067
I.B. quality—L.I. quality	−0.055 ± 0.061	0.243 ± 0.064
I.B. *quantity*—L.I. *quality*	0.084 ± 0.061	0.281 ± 0.063
I.B. quality—L.I. quantity	−0.020 ± 0.061	0.164 ± 0.067

The table of means and standard deviations indicates that the spread is not so great as to cast doubt on the validity of the results, except in the case of the ink-blot qualitative scores. The correlations show that a moderately high relationship obtains between the scores from the two sets of letters in the word-building test. Leaving these out of the discussion, however, the coefficients are all low. All of those for the men have such high P.E.'s as to render them negligible. The correlations for the women are higher throughout than are those for the men, but even so the relations indicated are not high. The coefficients of correlation between word-building and ink-blot scores, both measures; between ink-blot quality and linguistic invention quality; and between ink-blot quantity and linguistic invention quality, have P.E.'s small enough to render them reliable, even though low. The others are practically negligible. The ink-blot scores give higher correlations with the scores from the two other tests than do these two between themselves. The differences which appear between the coefficients for the men and those for the women indicate that it might be significant to compute separate correlations for the sexes more often than is usually done.

It would seem, from the coefficients of correlation given, that we are measuring by the three tests used, almost entirely different types of functioning, and that a person may be judged highly imaginative by one test and very differently by another. There would seem thus to be imaginations and not an imagination.

The next question is whether or not these tests call for the type of regrouping and rearranging of experience which is supposed to go with intelligence. Army Alpha had been given to most of the subjects used in this investigation, and the scores on it have been correlated with the imagination test scores. The results are given below:

ARMY ALPHA WITH	MEN	WOMEN
Word-building	0.478 ± 0.050	0.394 ± 0.061
Ink-blot quality	0.003 ± 0.064	0.160 ± 0.068
Ink-blot quantity	-0.004 ± 0.005	0.265 ± 0.066
Linguistic invention quality	0.245 ± 0.056	0.171 ± 0.068
Linguistic invention quantity	0.169 ± 0.058	0.326 ± 0.062

The correlation of intelligence with word-building is moderately high for both sexes; with the ink-blot scores it is negligible for the men and slight for the women. It is somewhat higher for the linguistic invention scores, but still little more than slight. Sex differences appear again. The men give much lower coefficients of *correlation* except in the case of word-building and linguistic invention quality. The P.E.'s indicate that the relationship between Army Alpha and the imagination test scores is reliable, though low, in the case of linguistic invention quality and word-building for the men, and word-building, ink-blot quantity, and linguistic invention quantity for the women.

It thus appears either that these tests, with the exception of word-building, do not measure very greatly the type of productive imagination which is supposed to go with intelligence, or that the presumption mentioned is not sound, or that the Army Alpha intelligence test does not represent that sort of intelligence in its score. Which of these alternatives is the correct one it will take much more searching investigation to reveal.

MINOR STUDIES IN THE PSYCHOLOGY OF ADVERTISING

XI. The Package as a Feature in Magazine Advertising

HARRY D. KITSON and JOSEPH J. CAMPBELL

From the Psychological Laboratory of Indiana University

The increasing interest that marketers are evincing in the package leads one to question whether it is not time to apply the historical technique and secure a quantitative expression of this interest.

With this end in view, a study was made of magazine advertisements in 1912 and 1922. The *American Magazine* was used as a medium likely to contain a variety of commodities sold in packages. The issues chosen for examination were those of December, 1912, January and November, 1913, and December, 1922, January and November, 1923. The advertisements of goods that were sold in packages were counted. Then the number of these that showed a facsimile of the package was determined. In 1912–1913 the advertisements for goods sold in package numbered 255, of which 117 or 46 per cent gave a facsimile of the package in the ad. In the next decade, however, the per cent of advertisements of packageable goods that pictured the package was 70.7.

TABLE I

MAGAZINES USED	TOTAL NUMBER OF ADVERTISEMENTS FOR PACKAGEABLE GOODS	NUMBER FEATURING PACKAGE	PER CENT FEATURING PACKAGE
December, 1912, January and November, 1913..............	255	117	46.0
December, 1922, January and November, 1923..............	605	428	70.7

As shown in table 1 the number of advertisements for goods *sold in packages* increased from 255 to 605 in the ten years, or 138 per cent. This reflects several things: absolute growth in advertisements; and increase in the number of commodities that are being sold in packages. The latter factor shows the increasing value which marketers are putting on the package as a market device.

In addition to this, however, is the fact that in these ten years *the frequency with which the package has appeared as a part* of the advertisement has increased from 46.0 to 70.7 per cent—an increase of 54 per cent.

According to the assumptions of the historical method, that a practise which has persisted and grown has probably been valuable, we may infer that to feature the package in magazine advertising has been profitable and will be a valuable feature of an advertising appeal.

MINOR STUDIES IN THE PSYCHOLOGY OF ADVERTISING

XII. Ratio Between Size of Type in Headline and Size of Advertisement

HARRY D. KITSON and HAZEL K. MORGAN

Whenever an advertising copy writer composes an advertisement he must decide what shall be the size of the headline in proportion to the rest of the advertisement. Since the function of the headline is primarily to attract attention, care is usually taken to use a large size of type. At the same time it is recognized that the type must not be so large as to violate principles of good taste. It must be kept down to a size proportionate to the size of the advertisement. In the effort to state what this proportion should be a tradition has arisen that the height of the headline should be $\frac{1}{10}$ to $\frac{1}{20}$ the height of the advertisement.[1]

In order to see what is actually the practise of advertisers in this respect, the writers undertook an investigation of current advertisements. Magazines of two sizes were used—the *American*, representing one size and the *Saturday Evening Post* representing another size. In each of these mediums three sizes of advertisements were examined—full page, two column and one column. One hundred of each kind in each periodical; giving a total of 600 advertisements examined. The specific issues were those for August, September, October, November and December, 1922, of the *American*, and January, February, March and April of 1924 of the *Saturday Evening Post*. Only advertisements were used which contained definite headlines, separate from body matter, occupying only one line. Measures were made with a ruler reading in inches.

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[1] Starch, Daniel, Principles of Advertising, Chicago, A. W. Shaw Co., 1923, p. 622.

RESULTS

Table 1 shows the average height of the headlines, the average deviation (the amount by which on the average the several measures deviate from the average height), and the ratio between height of type and length of advertisement. Thus, the type in the headlines of the 100 one-column advertisements in the *Saturday Evening Post* measured on the average 0.39 inch (about 48 point lower case). A page of the *Saturday Evening Post* is 12¼, or 12.25 inches. The ratio between the height of type and length of advertisement is, therefore, (39 + 12.25 =) 0.031.

TABLE 1

Average height of type in headlines of one column, two column, and full page advertisement and ratio to length of advertisement

	ONE COLUMN			TWO COLUMN			FULL PAGE		
	Average height	A.D.	Ratio	Average height	A.D.	Ratio	Average height	A.D.	Ratio
	inch			*inch*			*inch*		
Saturday Evening Post (size of page 12.25 by 9.37 inches).........	0.39	0.124	0.031	0.41	0.095	0.030	0.54	0.180	0.023
American (size of page 10.25 by 7 inches)..	0.34	0.102	0.030	0.39	0.098	0.020	0.41	0.113	0.025

The ratios are very close, ranging from $\frac{1}{23}$ *to* $\frac{1}{31}$ in the *Saturday Evening Post* and from $\frac{1}{25}$ to $\frac{1}{30}$ in the *American*. As is to be expected, the ratio is smaller in the case of full page advertisements. Indeed the table shows that as the advertisement increases in width the height of type used in the headlines increases, thus diminishing the size of the ratio: the ratio for full-page advertisements in the *Saturday Evening Post* and *American* being $\frac{1}{23}$ and $\frac{1}{25}$, respectively, while the ratios for single column (¼ page) advertisements are $\frac{1}{31}$ and $\frac{1}{30}$.

The A.D. (average deviation) is important since it shows concisely how great is the tendency in the several instances to deviate from the average. Though small in all cases, the A.D. is somewhat greater in the case of full-page advertisements; that is, the latter contain more headlines of relatively small size type and more of relatively large size type. This is probably a reflection of the fact that with large space one can employ many varieties of treatment. The fact that the A. D. in the case of the *Saturday Evening Post* is greater than that in the case of the *American* is probably due to the same fact, the page of the former being two inches longer and $2\frac{3}{8}$ inches wider than that of the latter. With the greater space one can use much white space or little, large illustrations, small illustrations, or none, long headlines or short ones, composed of small type or large type. It was noted that advertisements with no illustrations generally used larger, bolder, and more attractive type in the headline, relying on the headline to carry the burden of attracting the attention. Goudy Old Style seemed to predominate in the headlines of this class of advertisement.

CONCLUSIONS

1. The height of type used in one-line headlines of advertisements in the *Saturday Evening Post* and the *American Magazine* tends to bear a definite ratio to the length (and width) of the advertisement.

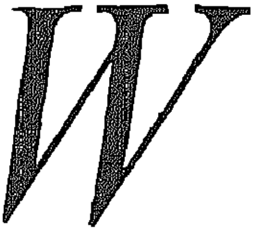
2. In both magazines the ratio decreases as the advertisement increases in width.

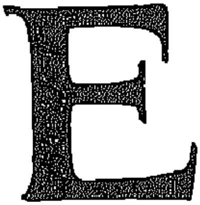
3. Though the average deviation is small in all cases, it is somewhat greater in the larger magazine and in the wider advertisements. This is probably due to the fact that in a larger space a greater variety of type treatment is possible.

5. The fact that such minute differences as these are brought out by the kind of measurement here employed speaks very favorably for the delicacy of the historical method as a scientific technique for the measurement of trends in advertising practice.

6. Finally we may conclude that whatever be the basis of the theory current among advertisers that the height of the headline should be between $\frac{1}{10}$ and $\frac{1}{20}$ the length of the advertisement, in the actual construction of advertisements of the sizes

here considered, the ratio is on the average much smaller, ranging from $\frac{1}{28}$ at a maximum to $\frac{1}{32}$ at a minimum, at least for one-line headlines. The esthetic wisdom of this can be seen from the two letters printed below. The first measures $\frac{1}{10}$ the length of a page of the *Saturday Evening Post* and the second, $\frac{1}{10}$ the length of a page of the *American Magazine*, both obviously too large to look good in those periodicals.





NOTES AND NEWS

YALE UNIVERSITY INSTITUTE OF PSYCHOLOGY

A group of research specialists will be associated together in an Institute devoted to the study of fundamental problems of human behavior, and to the training of personnel for the further pursuit of new studies in the field of teaching, research, and of practical application. The initiation of this enterprise is a step of the first importance toward increasing the facilities for psychological research and training. The need of such research has been increasingly felt in medicine, in industry, in education, in social work, in child welfare, and in various public problems. A generous contribution for a period of five years toward this undertaking has been made by the Laura Spelman Rockefeller Memorial.

Roswell Parker Angier, Professor of Psychology in Yale University will act as chairman of the group or Institute, which will be an integral part of the university. It will be closely associated with the Graduate School; its facilities will be available to advanced students who may be candidates for a doctorate or who may wish to engage independently in research.

Arrangements have been concluded for bringing to the Institute three men of unusual distinction: Robert M. Yerkes, formerly of the National Research Council, will have charge of the work in the field of comparative psychology with special reference to the primates; Raymond Dodge, formerly Professor of Psychology in Wesleyan University, in fundamental aspects of normal behaviour; and Clark Wissler, of the American Museum of Natural History, in the fields of racial, and particularly primitive, human behaviour in its cultural and social aspects. Other specialists will be appointed later.

Dr. Raymond O. Filter, Assistant Professor of Psychology at the University of Minnesota, and Dr. Homer B. Reed, Professor of Psychology and Education at Grinnell College, have each been appointed to an Assistant Professorship of Psychology at the University of Pittsburgh.

Dr. Donald A. Laird has been appointed to an Assistant Professorship of Psychology in Colgate University. During the past year he has been working at Yale University preparing a graphic scale of rating of emotional and temperamental traits to be used with college students. His desire is to measure these as definitely as possible in order that they may be of practical use in mental hygiene and vocational guidance. Departments of Psychology in a number of other institutions for both men and women are coöperating with him.

Mr. J. R. Gentry, a graduate student in Educational Psychology at Harvard, has been appointed to an instructorship in Psychology in Ohio University.

The Psychology Section of the British Association for the Advancement of Science, under the chairmanship of Professor William McDougall of Harvard, had at Toronto last August a very interesting and varied program. A number of psychologists and educators from the United States, Drs. Buckingham, Whipple, Ogden, Yoakum, Mayo and others offered papers and shared in the discussion. It is certain that psychologists in this country will find the report of these meetings of great value.

BOOK REVIEWS

Psychological Tests in Business. A. W. KORNHAUSER AND F. A. KINGSBURY. The University of Chicago Press, Chicago, 1924. Pp. ix and 194.

The appearance of this little volume proves to be the present day answer for many questions that are troubling employment managers and others who are concerned with the question of the value and progress of tests in selection and placement in industry and business. Its price ($1.75, postpaid $1.85) is reasonable considering the large amount of material the authors have abstracted, analyzed and reported. In addition to their editorial labors both authors have had actual experience in the administration of tests in business or in industry.

The titles of the chapters which we give following, indicate quite satisfactorily the content of the book.

The Nature of Psychological Tests.
Scientific Method in Constructing Psychological Tests for Business.
Psychological Tests for Office Occupations.
Psychological Tests for Non-Office Occupations.
The Place of Tests in the Personnel Program.
The Outlook for Tests in Business.

A few quotations will also exhibit the scientific temper and cautiousness of the writers when discussing the present significance and value of a testing program. On page 45 is given the major criterion used by the authors in determining the value of a test. As a matter of fact this criterion, which we quote, is just as usable in connection with any other means of selection or placement found in the employment office. "Does the test enable us to make predictions as to people's fitness for the job in an appreciably better, cheaper, or more expeditious manner than can be made without the test?" This principle is repeated on page 73.

On page 20 is given a simple classification of tests which, though not attempting to be scientific nor conclusive, nevertheless pictures for us present knowledge of relations and of test groups. We quote this classification below:

Functional classification of tests

1. Tests of proficiencies.
    a. Educational tests.
    b. Trade tests.

2. Tests for aptitudes.
    - *a.* General aptitude tests.
        - (1) General intelligence tests.
        - (2) Mechanical aptitude tests.
    - *b.* Special aptitude tests.
        - (1) Physical tests.
        - (2) Motor tests.
        - (3) Sensory tests.
        - (4) Tests of other special mental functions.
3. Tests of character and temperament traits.

On page 57 the authors offer a short classification of tests which attempts to give us an idea of the nature of the different varieties of the tests themselves and the relation they bear to the position or occupation being tested for. This classification follows:

1. Samples of the job.
2. Devices for measuring the separate abilities used in the job.
3. Devices for measuring the central or outstanding ability used in the job.
4. Imitative repetitions of the job. ("Replicas" or "miniature job tests.")
5. Devices bearing no apparent or obvious relation to the job.

As one reads through, he is impressed with the frequent introduction of cautions regarding the value of tests, their use and importance in any selection program, and their future possibilities. We note particularly the conclusion of the authors wherein they state as their opinion the belief that nothing more than a beginning has been made in the application of tests to business problems. This statement is made throughout the book, but in the closing chapter the authors indicate quite briefly and all too incompletely the fields in which there is practically no beginning yet made.

Two of the chapters are given over to summaries of existing data on the value of tests for first, office occupations; second, non-office occupations. The conclusions with reference to tests for clerical employees as given on page 96 may be quoted.

"If we combine all the available facts bearing upon tests for clerical employees, a very favorable conclusion is justified. We do not, of course, mean that tests are completely satisfactory in this field or that there is not need for a great deal of further research and improvement of test methods. Still less do we imply that tests are sufficiently accurate and reliable to warrant the abandonment of other methods of ascertaining the abilities of applicants, such as careful interviewing. What we do mean is that the evidence in support of intelligence and educational tests for clerical work is great enough to warrant the use of these tests *as one device* which, properly used, will aid in judging the merits of clerical workers. At the same time the use of the tests is to be viewed as experimental. That is to say, new standards must be established in each company where the tests are put into use and, as soon as feasible, the results from the tests must be checked and verified."

On page 139 the authors state: "Psychological tests for factory occupations have made less progress." The summary from which the above sentence is quoted leaves us with two impressions. In the first place the work done so far is exploratory rather than conclusive, and in the second place it seems evident that most of the investigators whose work shows any value whatever have, as yet, failed to complete the particular task reported. In other words, the field is so extensive that the few investigators so far interested in this type of research seem to have felt satisfied with a discovery of promising indications rather than with the presentation of scientifically proved results. Throughout the book the authors have made clear this need for persistence of effort in fields already partially investigated, rather than any immediate need for extension into other fields, however promising they may seem to be.

The difficulties connected with the problem of devising tests for any particular occupation are mentioned but are perhaps best demonstrated in the illustration given when the authors abstract the results of special researches. It is particularly interesting to note how much detailed work is essential to obtain even preliminary results in what ordinarily seems to be a simple occupation, that of typist. The illustration is given on pages 102 and 103 of the book. Here we note the use of eight different types of tests in attempting to investigate aptitude and rapidity of learning on the typewriter. A careful reading of these two chapters which give abstracts of previous work will convince anyone, we believe, of the need for persistent and continuous research before it can be said with confidence that tests are proved means of selection or placement.

The authors have purposely omitted any more than the briefest references to technical methods either in making or in evaluating tests. It is somewhat confusing to discover that detailed job analyses of particular occupations are not considered essential in the development of tests for particular jobs (page 54). On the other hand, it is to be noted that in most of the cases where successful results are actually reported, much work has been done by the investigators in preliminary analyses of the nature of the job for which they are devising tests. As a rule we cannot depend upon originality and genius to spend their time on problems of this sort. We must, therefore, see that a sufficiently detailed and rigorous scientific method is devised for the other type of worker. It is possibly true that ingenuity and insight may dispense with the detailed analysis of the occupation. It is wiser, in the opinion of the reviewer, for the maker of a test to have at hand as complete job descriptions and *analyses of the occupation as is possible before* undertaking to devise a test.

The authors recommend the statistical method of correlation for determining closeness of relationship between tests and criteria. On page 50 they add that it is possible to make simpler statements concerning this relationship. On page 63 it is called to our attention that the use of Best Workers and Poorest Workers is not satisfactory in determining the relationship between test and criterion. On page 72 it is again called to our attention that percentages may indicate satisfactorily relationships between success in a particular job and the test score. On page 51 and on page 74 the use of "critical score" is described and discussed.

It would probably be difficult for the uninitiated to determine from *the authors' statements the distinction between the necessity for using* correlation coefficients and the inclusion of all grades of workers, and *their statements with regard to the use of percentages and critical scores.* The confusion here is still a moot point among statisticians. A few paragraphs by the authors outlining in some detail the procedure in *evaluating the test and standardizing it* as compared with *the procedure in preparing it for practical use* in the employment office, would have made their contention much clearer.

There is some repetition in the text as, for example, at the bottom of page 49 and again at the bottom of page 67 the question of length of service is discussed in almost identical terms. It is also somewhat disconcerting to the interested reader to meet up with such phrases as "topic we need not enter," "do not concern us here," and "need not detain us now." Perhaps in the present status of testing these gaps are justified. A few foot notes, perhaps in more technical language, would possibly be *more satisfying* where one is deeply interested in the problems raised.

The authors have done an excellent service for business and industry. We may hope that they will see fit to bring out later editions which will keep step with progress in this *important new division of* personnel management.

C. S. Yoakum,
University of Michigan.

M. Luckiesh. *Light and Color in Advertising and Merchandising.* D. Van Nostrand Co., New York. Pp. xvi + 268. $3.00.

The rather uncertain field of color in attention and aesthetics is suggestively charted in this book by an eminent worker in the development of colored lighting. Whether one agrees with the charting or not there is little doubt but that this is the most complete and in general the soundest book that has appeared on the application of color in advertising and selling.

There are beautiful color plates—thirty-seven in all—that give the book a symphonic tone. But their effect is largely lost by rather vacuous and diffuse captions; the value of the book would be increased at least fifty cents if most of these captions were re-written so they had more apparent relevancy to the text. These color plates are perhaps responsible for the chief fault with the book, for one feels after the first four chapters that the author is indulging in excessive repetition to fill in the space between illustrations. A minor, and forgivable, fault is found in the attitude that is taken toward color which has a savor of propaganda and reminds one of a current dramatic offering in which a laundry solicitor is constantly repeating the merits of his laundry from "the effect of wholesomeness on the wash."

These may be real criticisms, and they may be the after effect of being struck in the eyes each morning for a week by the distressing yellow with which the cut edge of the paper is tinted. If this can be overlooked the book should be read.

W. W. CHARTERS AND ISADORE B. WHITLEY. *Analysis of Secretarial Duties and Traits.* Williams & Wilkins Co., Baltimore. Pp. 180. $2.50.

A very thoroughgoing job analysis has been made for a vocation that to all appearances would almost dishearten all attempts at a precise analysis. Still we have here just such an analysis successfully achieved.

The report is too detailed and complete to permit of an adequate summary. It merits reading not only for the information pertaining to secretarial work but as pointing out methods through which others interested in similar analyses of unstereotyped vocations may hope for success.

The weak thread—it is not a "spot"—in the book is that it has been necessary, of course, to depend entirely upon human judgments of the presence or absence or amount of traits possessed by secretaries. The remarkable uniformity of results on some traits may reflect greater value to these judgments than the psychologist feels warranted in granting them. So, too, the attempt to determine the traits in terms of actual actions and performances furthers their utility. These are but extenuating circumstances; such judgments and estimates still remain pitfalls in all work such as this.

There is immense provocative material in here for those interested in vocational education. None of it is beside the point and all of it has been determined on the job and not by some curriculum maker who never "secretaried" in his life.

A briefer report, designed especially for secretaries and employers, is to be obtained from the National Junior Personnel Service, Inc., 70 Fifth Ave., New York City, under whose auspices the investigation was conducted.

ARTHUR HOLMES. *Controlled Power: A Study of Laziness and Achievement.* Little, Brown, & Co., Boston. Pp. xiii and 219. $1.75.

Whether inaction "be definite and specific as in paralysis, or inherited and general as in idiocy, or slowly and suicidally formulated as in laziness, the divorcement between a man's conscious life and the expression of it in congruent action is a deep-seated and terrible malady." Having settled that, Dr. Holmes gives numerous interesting and inspirational illustrations of laziness and its conquering.

Psychoanalysis, glandular disturbances, and lactic acid find no place in this collection of bed-time sermonettes for ambitious grown-ups; in short, psychological and scientific statements are notably absent from this volume of the Mind and Health Series, much more absent than in the other volumes.

After one gets into the book it reads interestingly and the many cases used as illustrations will undoubtedly stimulate many readers to renewed activity. But that is the end of it, psychologically.

MERRILL JAY REAM. *Ability to Sell.* Williams & Wilkins Co., Baltimore. Pp. 64. $1.25.

The work of Dr. Ream with selective tests for insurance solicitors, to which many expectant references have been made, has at last been published. The successful solicitor has been found characterized by: "introversion, facility in immediate reply to objections, ready decision, average intelligence as measured by tests, economic and social conservatism, adaptability, and interest in people."

The report is of very brief compass. There is a minimum of irrelevant material, and possibly some that should have been included is absent. Especially is this the case with data relating to the reliability of the tests that have been used. If this has not been established of course the work rests on a chance foundation. Dr. Toops has eliminated this chance in his "Tests for Vocational Guidance of Children Thirteen to Sixteen" (see review) before relating them to the criteria. This is the first step in developing selective tests. Perhaps this has been done for all of the tests used, very probably for the intelligence test, but no mention is made of it in the report.

The business man was apparently in mind in the preparation of this volume for it is written with a lucidity and conciseness that is unusual and highly commendable. This is scarcely justification, though, for omitting reference to the determination of test reliability since the general reader needs more caution about this pitfall than does the technical reader.

An interesting feature of the book, aside from Dr. Ream's contribution, is an appendix in which credit is given to the various employees whose handiwork has helped print and bind the book, that it might come

› to the plant motto: *without blemish.* I suggest that they immedi-ely discharge the one responsible for the insufferable yellow cover.

VERETT S. LYON. *Education for Business.* University of Chicago Press, Chicago. Pp. xiv and 628.

In this new edition Dean Lyon has made but a few changes in his eritorious presentation of the ultimate aims of business education. e is one of the more vigorous writers who gives just emphasis to the oader aspects of vocational guidance and education, making it not a atter of concern for immediate placement and success but for ultimate oals. The book is one that takes the bearings of the entire field in rela-on to the general objectives, but most emphasis is given to the second-y schools.

Books on education usually drive me to bored antagonism. This did ot. The extensive use of charts and tables is as refreshing as it is nusual in a book on ultimate goals.

DONALD A. LAIRD,
Colgate University.

HARLES DEICH AND ELMER E. JONES. *A Study of Distinguished High School Pupils in Iowa, Bulletin, 1923, No. 46,* Department of Interior, Bureau of Education, Washington, D. C., 58 pp. $.10.

The purpose of this study is to throw light upon the technique of the chievements which a group of superior students have shown in High chool work. It includes 310 High School Seniors taken from various igh Schools in the state of Iowa. The average total enrollment from e various schools represented in this study is 20 per class, therefore very pupil in the group stands at the head of a list of 10 or 20 pupils rough a four year High School course. That makes the group a very perior class of students.

Two blanks were used in getting the data required for the study. ne blank was sent to the High School Principal asking for the grades the different subjects and the rank of the pupil, also the average rade of the entire Senior Class. It also asked for information about e home conditions and a social and financial standing of the parents f the child. The blank sent to the student asked for information con-erning his method of study, and his plan for his future, and also for ersonal history which would be valuable and necessary in a study of his kind. The child's achievement in the grades also was tabulated. t was found that the children stood high in the primary and inter-ediate grades as well as in the High School.

A comparison is made of the achievement of the girls and boys. The irls seem to rank higher than the boys, although there was not a de-ided difference. The data received concerning the home conditions showed that the parents were progressive which doubtless has a stimulating effect upon the child. The principals of the various High Schools stated that the parents in almost every case were interested in education. The average of children per family was found to be 4.2. This shows that the parents might have had more time to devote to each child in his school work which would account partly for the good school records. More than 60 per cent are of American descent. Sixteen other nationalities were represented. A study was made of the physical condition of the children and also of the time spent in school. The data received from the children's selection of life work is most interesting and valuable to school workers. Knowledge of their methods of study gives a valuable insight into the mental habits of these pupils. The entire bulletin is an argument for a thorough study of child life.

LULU M. STEDMAN. *Education of Gifted Children.* World Book Co., 1924. Pp. 102. $1.80.

This book is a description of an opportunity room for gifted children in the Training School of the University of California, Southern Branch. It was Dr. Wm. T. Root, Jr., of the University of Pittsburg who suggested the idea of organizing the class to Miss Stedman. Dr. Terman in the introduction points definitely to the need of such a study. The book is an important contribution to progressive education. In the first few chapters the opportunity room is well described. It gives one a clear picture of the educational attainments of the gifted children as well as their many degrees of intelligence represented. The methods which Miss Stedman used are clearly outlined. Also the curriculum suggestions are well defined by Miss Stedman. Case studies are recorded, giving the reader information of the special abilities of the various children. The child possessing the highest I. Q. yet reported, 214, is a member of this group and is described in chapter VII of the book. Various bits of research such as intelligence and school attainment are reported. Some of the children's projects and activities, their poetry and descriptive writings are reported.

In the conclusion Miss Stedman says that it is not wise to push the exceptionally gifted child as rapidly as possible through the grades, but that it is better to enrich the curriculum and keep him in an environment affording opportunities for association with his peers both mentally and physically.

M. LA VINIA WARNER,
Ohio University.

FRANK N. FREEMAN, Editor. *Visual Education.* University of Chicago Press, Chicago, 1924. 391 pp.

In this volume we have a comparative study of motion pictures and other means of instruction. The volume was made possible by a grant rom the Commonwealth Fund and the cooperation of a group of thireen investigators including the editor, Professor Freeman.

The contents of the book are organized into two parts. Part I conisting of 81 pages presents the problem and method of procedure in the tudy and a concise summary and interpretation of the results of the vestigation. This is a commendable feature of the undertaking. It not only an economy of time for the reader but also tends to prevent isinterpretations.

Part II gives at length the details of each of the thirteen investigaions carried on by different members of the investigating staff. Here found information concerning the conditions under which the experients were performed as well as the treatment of the results.

An examination of the contents of Part II reveals the fact that two eneral themes were investigated—the relative efficiency of motion picres and other means of instruction and an analysis of the content of otion picture films on the basis of subtitles, still objects and moving bjects. Some idea of the scope of the investigation may be gained by n enumeration of the different subjects to which the several means of struction were applied. We note narrative history, economic history, hysical geography, nature study, industries of iron, sugar, etc., handriting, handwork, physics, cooking, agriculture, English. Thus we d a rather wide range of subject matter used in the investigation as ell as representation material lending itself to moving pictures.

Some of the conclusions resulting from the investigation are here ted. There is no indication that pictures in any form can take the ace of language in the presentation of subject matter to children. It true that pictorial representation, including motion pictures, have a ace in instruction. But their use is limited to certain kinds of mateal. Demonstration and oral instruction have shown superior results so many instances that no one would care to champion the displaceent of these as a mode of instruction.

The evidence resulting from the investigation indicate that motion ctures as a means of instruction are superior to other visual aids—des, still pictures, stereographs—only within a restricted range of bjects. Outside this restricted range of subjects the older visual deces are as effective or even more effective than motion pictures. In e teaching of science and handwork—making of boxes and weaving of ats—demonstration of the processes by the teacher give better results an motion pictures.

A popular and generally accepted contention assures us that motion ctures are of outstanding and unparalleled value in arousing an intert in a subject. This was not found to be true. It was found, however, at the use of the film did supply a peculiar type of content of expersce. But the general and lasting stimulating effect was not found.

There is evidence found in the study that there has not been sufficient care in selecting subject-matter to which motion picture instruction has been applied. From the viewpoint of economy it is unwise to put subject-matter in the form of motion pictures when demonstration by the teacher and other forms of presentation give as good or nearly as good educational results. Films are expensive and are greatly restricted in their use. The authors of the investigation suggest that their usefulness would be enhanced by selecting only such material for such treatment as come within the peculiar province of the film. Material void of motion or action—material containing tables, diagrams, etc.—is not well adapted to motion pictures. They have, however, a value in furnishing raw material of instruction involving motion and action that are inaccessible to the teacher and that can not be reproduced by her.

It is also suggested that small units of material are perhaps better adapted to the film than large units requiring long films. In the long film too much material is presented at one time. Besides there is a tendency to include material not suitable for the motion picture. In a word the authors of the investigation have sought to define the function and to promote the usefulness of motion pictures.

The investigation is a timely one and no doubt will prove a valuable contribution to modern pedagogical literature. It will have a strong tendency to place an important educational instrument in its proper perspective.

INEZ MAY NETERER. *A Critical Study of Certain Measures of Mental Ability and School Performance.* Warwick and York, Baltimore, 1923. Pp. 141.

In this small volume we have the results of a critical study of a group of fourth grade pupils in the public schools of Seattle, Washington. In all six different tests were used—Stanford Revision, Otis Group Intelligence, Monroe Silent Reading Form 2, Starch Arithmetic Scale A, Woody Arithmetic Scale, Series B, and Courtis Arithmetic Tests, Series B. In addition to the information gleaned from giving the above tests, the author secured and used in her comparisons the teachers' *estimates* of the general ability of each child included in the study, and the teachers' *marks* given at the end of the school year.

Some of the conclusions are of interest. From a comparative study of the data furnished by the investigation, it appears that none of the tests under consideration can be used to foretell achievement in any other of the tests or measurements. In no instance is there a correlation sufficiently high to be markedly significant. It was found that there was a tendency toward low and non-significant correlations between the intelligence tests and educational measurements. The correlation beween teacher's estimates and educational measurements is closer than between teacher's marks and educational measurements. The educational measurements do not show high and significant correlations. No great sex difference was found. But it was revealed that the same tudent took widely different relative positions in the different tests, thus indicating that each individual is more or less an assembly of sevral special abilities rather than a single general ability.

In this study we have an attempt to subject the tests themselves to a ritical analysis with the result of rather startling revelations. It is this ype of investigation that the measurement movement must undertake.

The body of the book contains many footnotes referring to related tudies. The footnotes are more than mere page references Most of hem suggest the essential findings of the study cited. This is a helpful evice. The book furnishes a bibliography of nearly two hundred titles overing the general fields of intelligence testing and educational measurements. The general problem attempted in the volume should be arried forward with many other tests.

WILLIS L. GARD,
Ohio University.

EDWIN E. SLOSSON, PH.D., AND JUNE E. DOWNEY, PH.D. *Plots and Personalities. A new method of Testing and Training the Creative Imagination.* Century Co., New York.

The attempt to cultivate ability to write is no new thing but specific uggestions as to how latent capacity may be brought into activity are are. Such concrete suggestions are presented by the authors of this olume.

It is an ancient notion that creative ability is a gift of the gods so otent that it would function even in a vacuum. It is certain, however, hat the writer must discipline himself through exercise of his gift. For ractice most interesting exercises are offered. For self-rating, also, hese exercises are full of suggestion.

Dr. Downey's technical studies of the psychology of literature have iven her the knowledge concerning the mechanism of creative writing hat she so delightfully presents. Being herself a creative writer she i all the more fitted to speak with authority.

Dr. Slosson's gift for discussing technical and abstract subjects in the language of every-day and in a style that makes the road to learning an asy one to travel is well known. He writes of what he knows from his wn experience.

Fertility of ideas, creative imagination, no doubt are innate but are rought into play by the stimulus of situations of every day life. It is he creative mind, however, which grasps their significance and transmits individual experience into universal.

Examples of such situations are found in the "agony column" of the London Times. These advertisements furnish material for testing the imagination. The results of this test of imagination serve as a basis for characterizing the imagination as inert, stereotyped, melodramatic, generalizing, particularizing, or ingenious, that is, inventive.

When one's imagination is classified, the next point of interest is whether or not imagination can be cultivated. This question the authors answer in the affirmative and discuss the importance of mental set, release of inhibitions, cultivation of the emotions, in the training of the imagination.

Other topics treated are mental traits of the novelist, sources of literary material, character creation, plot-construction. At the end of the book tests of literary ability are included under the caption, "Putting a Foot-Rule on the Imagination."

A particularly interesting and important part of the discussion deals with expression of the quality of the product.

LOUISA C. WAGONER,
University of Wyoming.

CHARLES BAUDOUIN. *Psychoanalysis and Aesthetics.* Translated from the French by Eden and Cedar Paul. Dodd, Mead and Company, New York, 1924. $4.00.

M. Baudouin in *Psychoanalysis and Aesthetics* makes an intensive study of the symbolism in the poems of the Belgian poet Emile Verhaeren. He supports the thesis that in Verhaeren's poetry the frequently repeated symbols such as the garden, the factory, the faces of the clocks in the towers, the towers themselves, the contrast between black and gold, the rushing trains, the monks, and trees, and the reflections in stagnant water reveal the desires and conflicts of the poet's inner life, and that a psychoanalytical interpretation of the symbols affords a means of explaining significances which would otherwise be hidden. Thus he would show that psychoanalysis is a valuable aid in the interpretation, appreciation, and criticism of poetry.

The translators in their preface speak not altogether flatteringly of Prof. F. C. Prescott's *The Poetic Mind.* But Professor Prescott in his work at least has the merit of hammering away at one fundamental point indispensable at the present early stage of the study of psychoanalysis and aesthetics. He attempts to prove that poetry does arise from the depths of the unconscious. The lack of just such proof is likely to be felt in M. Baudouin's book. It is true that the introduction unfolds a theory of the relation of poetry to the unconscious. The reader, however, in spite of the ingenious explanations distributed through the chapters following the introduction, is by no means always assured that Verhaeren's symbols have the origin which M. Baudouin would ascribe to them.

For example, Verhaeren, in writing a poem about his native village, tells of a tower which was burned down and which after three years was built again. If there is a secondary meaning underlying the obvious meaning, Verhaeren may have been altogether deliberate in his selection of the symbols and fully aware of their implication. M. Baudouin, having pointed out that Verhaeren was a particularly spontaneous poet and that the symbolists in general attempt to express sentiments and emotions which escape analysis, is too ready to assume that each and every symbol in its entirety is a product of the unconscious. All in all, the book furnishes a somewhat easy target for one who is inclined to scoff at Oedipus complexes and the other equipment of the Freudian psychology.

B. L. Jefferson,
Ohio University.

Joseph A. Leighton. *Religion and the Mind of To-day.* D. Appleton and Company, New York. 372 pp. $2.50.

Although this work treats of many of the religious questions in present day discussion, it is not an effort to enter the acrimonious debate between Fundamentalists and Modernists. It plows much deeper than most discussions of this issue. The author believes that under the guidance of the special sciences a new civilization is coming into being and that a reconstruction or intellectual recasting of our inherited religion and social ethics to guide and inspire this civilization is imperative. Professor Leighton here undertakes this recasting and places the essential teachings of Christianity in the setting of modern scientific thought and problems. The result is really in outline form a philosophy of religion worked out in the light of a scientific world-view. Trained n the special sciences, the history of religions and philosophy, the author of a comprehensive work on systematic philosophy, as well as a teacher of many years' experience in contact with student life in a state university, Professor Leighton brings to this study such a thorough grasp of knowledge and familiarity with human experience past and present as at once stimulates confidence.

At the heart of Professor Leighton's philosophy is a reasoned faith n the existence of a Moral World-order or Supreme Spirit, the value and high destiny of the human personality, and in Jesus Christ as the supreme (though not the only) revealer of the true way of life. He divides his treatment into three parts. Part I, devoted to Religion and Culture To-Day, defines religion and relates it to science, theology, traditionalsm, and to general culture. In Part II, headed The Religion of Jesus, he author seeks to separate the religious and moral teachings of Jesus on the one side from the accumulations of theology, tradition, dogma nd doctrines, on the other. Here the chapter on Apotheosis and Incaration, dealing with the Logos doctrine and the incarnation in the light f history and science, also the chapter on Creeds as Spiritual Symbols, dealing with the Apostles' and Nicene creeds, are especially timely and illuminating. In Part III on the Validity of Religion, the author first offers a criterion for the evaluation of religions in terms of value and function, then goes on to treat in the spirit of science such subjects as the existence of God, miracles, the problem of evil, prayer and faith, immortality, and social progress.

To those who sensing the widened horizons of modern culture raise the question: What is there left of our religious tradition? this book gives a critical yet reverent, sympathetic and helpful answer. It is destructive to worn-out and antiquated views; yet it is predominately *constructive in that it lays a foundation for faith* upon a higher intellectual level.

FLOYD HENRY ALLPORT. *Social Psychology.* Houghton Mifflin Company, New York. 453 pp. $2.50.

Professor Allport endeavors to provide for those interested in social science a social psychology embodying the results of the most recent psychological investigations. Three lines of approach are employed, viz., the *behavior viewpoint*, the *experimental method*, and the *psychoanalysis* of Freud and Jung. The genetic and inductive methods predominate. Behavior is interpreted as essentially physiological. It involves a need in the organism (sex and hunger are the ultimate needs) and the reaction of the organism to satisfy the need. The results of *laboratory experiment, questionnaires and critical observation upon* individual and group behavior are brought to the support of theories and principles of explanation. The Freudian emphasis upon sex (though with modification) and Jung's use of such terms as "introversion" and "extroversion" are used in the explanation of social adjustments involving the overt and covert conflicts incident to anger, sex, inferiority and superiority.

Social psychology is defined as "the science which studies behavior of the individual in so far as his behavior stimulates other individuals, or is itself a reaction to their behavior; and which describes the consciousness of the individual in so far as it is a consciousness of social objects and social reactions" (p. 12). Behavior arises through the "interplay of stimulation and reaction between the individual and his environment." It is physiological. Consciousness which accompanies these reactions is an aid in the selection of explanatory principles within the mechanistic field; it is in no way a *cause* of the bodily reactions, hence it cannot be an explanatory principle (pp. 2–3). In harmony with the present tendency among writers on social psychology (e.g., Dewey, Edman, Gault, Bogardus) the *instinct theory of man's* inherited equipment is rejected and a less definitely fixed native endowment is regarded as the basis of human behavior, viz., two types of prepotent reflexes: (1) The avoiding reactions, and (2) the approaching reactions. These eflexes are divided into six classes: Startling and withdrawing, rejecting, struggling, hunger reactions, sensitive zone reactions, and sex reactions. Through the development of conditioned responses and the almost unlimited modification of these reflexes, particularly on the afferent and efferent sides, habits of adjustment are set up. Prepotent reflexes and acquired habits are thus the central principles of explanation. Many of the human responses to stimuli formerly regarded as instincive are here rightly viewed as acquired.

Throughout this work social psychology is taken as a science of individual behavior. In the individual are found the behavior mechanisms adequate to explain the interaction between individuals and groups. Collective consciousness, e. g., that of the group, crowd, mob, is simply the aggregation of those states and reactions of individuals which, owing to similarities of constitution, training and common timulation, are possessed of a similar character (p. 6). There is no rowd brain or nervous system, but only nervous structures possessed by individuals. Accepting a modified form of the James-Lange theory of emotion, and rejecting the view that there is anything instinctive bout imitation, sympathy and suggestion, the author goes on to explain hese terms as collective names "embracing a number of distinct elementary mechanisms" (p. 242). These terms merely describe uniformiies in individual behavior. Progress, the author concludes, is "inreased success in living" (p. 426); it consists not in the pursuit of a xed goal of perfection, but rather in the securing of that highest happiess for the individual (not the social whole) in the perpetual sequence f struggle and achievement (p. 425).

To those students of social science who are able to accept a rather xtreme behavioristic viewpoint, together with the Freudian stress upon ex and hunger as the primary drives in social living, this book will be welcomed. Seldom does one find a book more clearly and interestingly written. The concise summaries and the references at the close of each hapter will be of help to the classroom student. To those of the reviewer's persuasion who believe that psychology cannot be reduced o the physiology of the nervous and muscular systems, because it canot evade a study of the behavior of consciousness, its differentiating haracter, this book, is disappointing. (The author does recognize onsciousness as a kind of behavior, but he devotes little attention to .) The individual self, capable of rational reflection, selective evalution of interests and motives, is more than a bit of physico-chemical or hysico-mechanical matter. A psychology limited to a treatment of man's bodily reactions involves a false simplification of the facts. It is n abstractionism, and is especially weak in its interpretation of man's esthetic, moral and religious experiences. Moreover, the author's mphasis of the individual in the explanation of group phenomena may ubject his position to the charge of psychological atomism.

Walter S. Gamertsfelder,
Ohio University.

NEW BOOKS AND PAMPHLETS RECEIVED[1]

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

Field of Psychology. MADISON BENTLEY. D. Appleton Co., New York. Price $3.50. 545 pp.

Modern Theories of the Unconscious. W. L. NORTHRIDGE. E. P. Dutton & Co. New York. 192 pp.

Normal Mind, The. WILLIAM H. BURNHAM. D. Appleton Co. New York. $3.50. 702 pp.

Personal Equation in Motor Capacities. MARTIN L. REYMERT. Scandinavian Scientific Review, Kristiana, Norway. Vol. II, Nos. 3 and 4.

Principles of Education. J. CROSBY CHAPMAN AND GEORGE S. COUNTS. Houghton Mifflin Co., Boston. $2.75. 645 pp.

Psychological Principles Applied to Teaching. WILLIAM HENRY PYLE. Warwick & York, Baltimore. 197 pp.

Psychology and Industry in France and Great Britain. DOUGLAS FRYER. University of Utah. 7 pp.

Salvaging of American Girlhood. ISABEL DAVENPORT. E. P. Dutton & Co. New York. 302 pp.

Sigmund Freud. FRITZ WITTELS. Dodd, Mead & Co., New York. $3.50. 287 pp.

Soul of Your Child, The. HEINRICH LHOTZKY. Dodd, Mead & Co., New York. 163 pp.

Tidschrift Van Den Nederlandschen Werkloosheids-Raad. Vol. 7, Nos. 4-10. Amsterdam.

Use of the Question in Classroom Instruction. CHARLES W. ODELL. University of Illinois, Urbana, Ill. 18 pp.

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[1] Mention here does not preclude further comment.

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